



Annual Summary Compilation:
**New or ongoing studies
of Alaska shorebirds**



October 2012

No. 11

Compiled and edited by River Gates for the Alaska Shorebird Group. Anyone wanting additional information about these studies should contact the individual(s) noted at the end of each project summary. Data provided within annual summaries should not be cited or used for any purpose without prior approval from the responsible contact person.

Cover photo of the Kamchatka subspecies of Eurasian Oystercatcher (*Haematopus ostralegus osculates*). First individual recorded in Alaska at Buldir Island, 26 May 2012 by Ronan Dugan/U.S. Fish and Wildlife Service

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EXECUTIVE SUMMARY

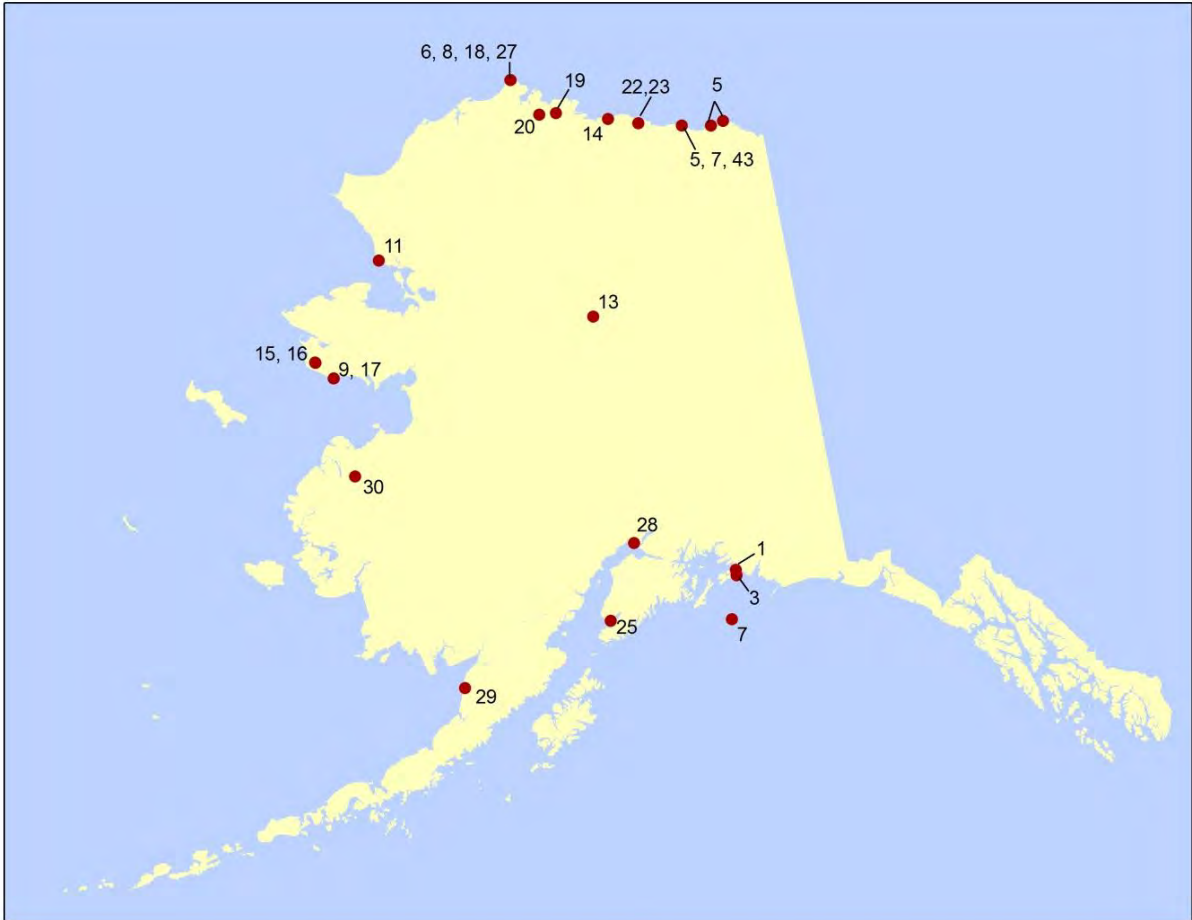
RIVER GATES, ALASKA SHOREBIRD GROUP SECRETARY

Welcome to the 2012 summary report of ongoing or new studies of Alaska shorebirds. This is the twelfth consecutive report put together by the Alaska Shorebird Group. In this document members of the Alaska Shorebird Group compiled annual summaries for 31 studies highlighting many interesting projects investigating Alaska shorebirds. The number of studies reported here is down by 28% from 43 contributed summaries in 2011. This annual compilation is the only written record we have of shorebird projects in the state of Alaska and provides a valuable timeline of shorebird science activities for this region.

Among the 31 unique projects there were a total of 70 investigators involved in these projects, 17 of which participated in more than one project. The Alaska Shorebird Group continues to be a highly collaborative organization with a large membership of productive principal investigators. Women led 13 of the total studies (42%) and accounted for 45% of the total investigators. Non-government organizations took the lead in the most projects (12) including 39% of the total projects. For non-government organizations (NGO) this included the Manomet Center for Conservation Sciences ($n = 3$), Wildlife Conservation Society ($n = 5$), Prince William Sound Science Center ($n = 3$). The U.S. Fish and Wildlife Service ($n = 7$) spearheaded a number of projects and lead the way for government agencies. A diversity of American and Canadian educational institutions led projects including 3 by Kansas State University, and one project each for the following graduate programs: Cornell University, University of Colorado Denver, University of Alaska Fairbanks, Montana State University, Brigham Young University, Simon Fraser University, and the University of Missouri. Guiding and birding groups also participated in leading one project each.

The map of our study site locations within Alaska (next page) clearly shows that shorebirds live up to their name, with all study sites, except for one, located relatively close to the coastline. The interior Alaska shorebird project at Kanuti Wildlife Refuge is shedding light on a poorly studied aspect of Alaskan shorebird ecology. Sarah Saalfeld kindly prepared the state of Alaska map detailing the primary study locations. I would like to acknowledge the talented photographers who submitted their superb images for use in this document. Shorebirds and the people who study them are apparently very photogenic. Photo credits and a brief caption are listed for each photo.

Thank you to the principal investigators for making contributions to this year's annual summary report. Big thanks to the field biologists for their valiant efforts in conducting these important field studies in Alaska. We look forward to many more years of fruitful research and conservation of Alaska's breeding and migratory shorebirds.



This map displays the location of shorebird study sites summarized in this report. Each site is represented with a red dot and an accompanying number. The number corresponds to the numbered project title for each summary in the report (see Table of Contents). In some cases, the study site covered a relatively large region and included many field locations. In these cases, a subset of the more important sites within the larger study region is displayed. This map *does not* display sites where field work was conducted solely outside of Alaska (Project summaries 2), studies that had no field data collection in 2012 (Project summary 21), and studies that had no field component and/or relied on data from other sources (Project summary 24 and 26). Projects 4, 10, 12 and 31 were conducted at the Arctic Shorebird Demographics Network study sites (see page 12 for map).

#1 SITE FIDELITY WITHIN THE COPPER RIVER DELTA, ALASKA BY MIGRANT SHOREBIRDS

INVESTIGATOR: MARY ANNE BISHOP, PRINCE WILLIAM SOUND SCIENCE
CENTER

Migrant shorebirds are likely to exhibit fidelity in stopover site selection between years because coastal stopover sites are often widely spaced and limited in number. In 2008, I began a study at Hartney Bay on the western Copper River Delta to determine if site fidelity between years and to a specific location is a common behavior during spring migration. During May 2008, 2009, and 2011 a combined total of 427 Western Sandpiper, 185 Least Sandpiper, 4 Semipalmated Sandpiper and 13 Semipalmated Plover were mist-netted and color-banded at Hartney Bay. All birds received a green flag on the lower right and a USFWS band on the upper left leg. Color bands on the lower left leg were used to distinguish year cohort (red for 2008, light blue for 2009, orange for 2011) and age (adults = 1 band, juveniles = 2 bands). From 29 April -18 May 2012 an observer spent 2-3 hours daily at high tide scanning flocks for banded birds. Six Western Sandpipers previously banded at Hartney Bay were resighted, including two from 2008, three from 2011, and one missing its color band identifying the year cohort. In 2013 we plan to tag shorebirds with alpha-numeric bands.

Contact: Mary Anne Bishop, Prince William Sound Science Center, PO Box 705, Cordova, AK 99574. Phone: 907-424-5800 x 228; email: mbishop@pwssc.org.

#2 SHIFTS IN SPRING STOPOVERS FOR SURFBIRDS AND BLACK TURNSTONES

INVESTIGATORS: MARY ANNE BISHOP, PRINCE WILLIAM SOUND
SCIENCE CENTER AND AUDREY R. TAYLOR, UNIVERSITY OF ALASKA
ANCHORAGE

Currently, little is known about how Black Turnstone and Surfbird populations migrate up the Pacific Coast to their Alaska breeding grounds, and whether these migration patterns are shifting with climate or environmental change along the route. In spring 2010 we captured, banded and radio-tagged 7 Surfbirds and 34 Black Turnstones at Oak Harbor Washington. At this same site in April 2011 we tagged 13 Black Turnstones with alpha-numeric bands and light-level geolocators. We returned 11 times to the Oak Harbor banding site between July 2011 and April 2012. We resighted at least three Surfbirds and six Black Turnstones banded during 2010 (cohort-marked only) and nine individually marked Black Turnstones banded in 2011. Using an air-powered net gun, we captured 28 turnstones in spring 2012, including 3 originally equipped in 2011 with geolocators. We are currently analyzing the geolocator data. Future research will include additional efforts to recapture geolocator-equipped turnstones at Oak Harbor during November 2012. In spring 2013, we plan to deploy geolocators on nesting birds at Yukon Delta National Wildlife Refuge and Cape Krusenstern National Monument as part of a larger study

connecting changes in rocky coast shorebird migration patterns to possible climate change on their breeding grounds.

Contact: Mary Anne Bishop, Prince William Sound Science Center, PO Box 705, Cordova, AK 99574. Phone: 907-424-5800 x 228; email: mbishop@pwssc.org.

#3 MONITORING SEMIPALMATED PLOVERS BREEDING AT EGG ISLAND, COPPER RIVER DELTA

INVESTIGATORS: MARY ANNE BISHOP, PRINCE WILLIAM SOUND
SCIENCE CENTER AND ERICA NOL, TRENT UNIVERSITY

North American shorebirds have experienced population declines over the last several decades. Semipalmated Plover, however, are one shorebird species whose numbers are apparently stable. Building on research conducted in 2006 and 2008, we began a study in 2011 on a breeding population of Semipalmated Plovers at Egg Island, a barrier island on Alaska's Copper River Delta. The objectives of our study are to monitor breeding phenology and to determine survivorship based on return rates of banded breeders. During the first week of June 2012, we located 17 nests. Nest initiation was approximately one week later than in previous years with full clutches observed in only 10 of the 17 nests. In all, we banded seven adult Semipalmated plovers and resighted 18 plovers banded previously on Egg Island. Additional field work is planned for Egg Island in 2013.

Contact: Mary Anne Bishop, Prince William Sound Science Center, PO Box 705, Cordova, AK 99574. Phone: 907-424-5800 x 228; email: mbishop@pwssc.org.



Adult breeding Black Turnstone at Cape Krusenstern National Monument, June 2012.

#4 ARCTIC SHOREBIRD DEMOGRAPHICS NETWORK: OVERVIEW

INVESTIGATORS: STEPHEN BROWN, MANOMET CENTER FOR CONSERVATION SCIENCE, RICK LANCTOT, U.S. FISH AND WILDLIFE SERVICE, BRETT SANDERCOCK, KANSAS STATE UNIVERSITY AND RIVER GATES, U.S. FISH AND WILDLIFE AND MANOMET CENTER FOR CONSERVATION SCIENCES.

Project Goals and Approach

Recent shorebird trend analyses indicate that many North American shorebird species are declining, but we do not know why. The overall goal of the Arctic Shorebird Demographics Network (Network) is to conduct demographic analyses for several target species that will help determine factors limiting population size. The Network measures demographic rates such as adult and juvenile survival, productivity, and other demographic parameters at various life history stages. In addition, the power of the Network will substantially increase our ability to address a wide variety of other science and conservation goals that can only be studied at a regional or global level, such as migratory connectivity studies that require work across the entire range of a species. Multiple study years are needed to accurately measure survivorship of marked individuals, and also because significant year to year variation occurs in the demographic rates of shorebirds. We anticipate that the Network will provide data critical to conservation planning for shorebirds through its planned completion in 2015.

Network Collaborators

The Network involves participation of collaborators from federal and state/provincial agencies (USFWS, USGS, Environment Canada, Ontario Ministry of Natural Resources), academic institutions (University of Alaska Fairbanks, Cornell Lab of Ornithology, Kansas State University, Simon Fraser University, Mount Allison University, University of Florida, Moscow State University, Lomonosov, University of Quebec, Rimouski and Trent University) and non-profit organizations (Manomet Inc., Wildlife Conservation Society). All are actively conducting Arctic shorebird research and can implement similar protocols at their study sites. In addition, the Network relies on partners across the range of the target species for resighting efforts of banded birds. Current participants include 15 breeding season study sites spanning the entire Alaskan ($n = 7$), Canadian Arctic ($n = 5$) and Russian Arctic ($n = 2$, Fig. 1). Project summaries are available for the following Alaska sites: Nome (#9, 17), Cape Krusenstern (# 11), Barrow (#18), the Ikpikpuk River (# 20), and Prudhoe Bay (# 19). Sites in Canada include Mackenzie Delta, Bylot Island, East Bay and Burntpoint Creek (new in 2012). Sites in Russia include Chaun Delta and Lower Khatanga River both new in 2012.

Third Year Completed

2012 marked the third year (of 5 years) where data were collected in the field. In preparation for this work, the protocol subcommittee revised the 2011 field protocols (based on feedback from

the second year) and developed new field components (e.g. chick banding). A major portion of our field work involves locating nests and banding of our target species, including Semipalmated Sandpiper and Dunlin at most sites, and Western Sandpiper, Pectoral Sandpiper, and Red-necked Phalarope at several sites. Other species are banded as well, depending on the particular focus of a site. In 2012, personnel from the Network located > 1,500 nests belonging to 18 species, and banded > 1400 individuals belonging to 17 species. In addition, as part of an effort to understand how local conditions influence nest success and adult survival, we collected data on weather, invertebrate abundance, predators, and lemmings.

Network Side Projects

Network side projects are investigations that are conducted at the Network study sites that are outside the framework of the core demographic study objectives. The following side projects have been implemented by Network Collaborators: Dunlin migratory connectivity, Semipalmated Sandpiper migratory connectivity, pond hydrology, spring phenology, and avian health studies (#31 [avian malaria], #12 [gut microbiota] and #10 [methyl mercury]).

Lead Organizational Roles

Stephen Brown at Manomet Center for Conservation Sciences is the overall coordinator for the project, and supports group planning, communication, and group funding. Rick Lanctot of USFWS is the Science Coordinator, and leads the design and development of field protocols, side-project coordination, and group funding. Brett Sandercock of Kansas State University leads the group on study design issues and will lead the demographic analyses. River Gates works for both Manomet and USFWS and focuses her efforts on protocol development, databases management, data compilation and summaries, in addition to general Network coordination and logistical support. Joe Liebezeit of the Wildlife Conservation Society, Paul Smith of Environment Canada and Brooke Hill of USFWS serve on the protocol development committee.

Contact: Stephen Brown, Manomet Center for Conservation Sciences, P.O. Box 565, Manomet, MA 0234. Phone: 508-224-6521; Email: sbrown@manomet.org



Figure 1. Study site locations of the Arctic Shorebird Demographics Network, 2012. Map prepared by S. Saalfeld.

#5 RESOURCE AVAILABILITY FOR SHOREBIRDS AT DELTA MUDFLATS DURING THE POST-BREEDING PERIOD IN THE ARCTIC NATIONAL WILDLIFE REFUGE

INVESTIGATORS: ROY CHURCHWELL, UNIVERSITY OF ALASKA, FAIRBANKS; ABBY POWELL, U. S. GEOLOGICAL SURVEY, ALASKA COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT; STEVE KENDALL, U.S. FISH AND WILDLIFE SERVICE; STEPHEN BROWN, MANOMET CENTER FOR CONSERVATION SCIENCES.

Studies have established that several species of shorebirds congregate along the coast of the Arctic National Wildlife Refuge during the post-breeding period. It is thought these birds are staging in preparation for a southern migration; however, it is possible they are already migrating when they reach Refuge coastal areas. Our project was initiated to investigate shorebird use of Refuge delta mudflats during the post-breeding period.

We conducted pilot studies in the summer of 2009 on the Jago River Delta to develop methods that were then expanded to two other deltas in summers (July 15 – August 31) 2010 and 2011, including the Canning, and Okpilak/Hulahula. We collected core samples to look at invertebrates and sediment characteristics across each delta within 250-m grid cells during three time periods: early, mid, and late season. We also counted shorebirds across the mudflat within 100-m grid cells every 3 days during the study period. We collected blood samples from shorebirds to investigate correlations between triglyceride levels and available resources. Blood samples were collected both early and late during the study period, to investigate temporal differences in shorebird fattening rates. Finally, we also collected weather data (temperature, wind speed, and wind direction) and water depth at each camp to investigate the role of environmental factors on use of coastal habitats by shorebirds.

Our research during the 2012 season included several experiments on the Jago as well as collecting early and late invertebrate samples at the Canning and Okpilak/Hulahula deltas. At the Jago we surveyed shorebirds every three days, and collected early, mid, and late season invertebrate samples. We collected fecal samples from semipalmated sandpipers for a molecular study that will determine what the shorebirds were feeding on. We collected information on the feeding rate of semipalmated sandpipers and dunlin by counting the number of pecks and captures of a feeding bird during one-minute count intervals. Finally, we conducted an enclosure experiment where we collected samples from inside and outside a 3x3 m enclosure a week before the peak in migration, during the peak, and a week after the peak. The extra information we collected at the Jago this year will inform some of the questions we have generated during the past 3 years of our research.

We are currently in the lab processing samples from this summer, and proofing data. After lab work the next step will be writing publications and the development of Churchwell's dissertation.

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#6 NEST-SITE SELECTION IN ARCTIC-BREEDING SHOREBIRDS:
EFFECTS OF HABITAT AVAILABILITY, SNOW, CON- AND
HETERO-SPECIFIC SHOREBIRD DENSITIES, AND MATE
FIDELITY

INVESTIGATORS: JENNY CUNNINGHAM AND DYLAN KESLER,
UNIVERSITY OF MISSOURI, COLUMBIA AND RICHARD LANCTOT, U.S.
FISH AND WILDLIFE SERVICE

Habitat selection in breeding birds results from a series of innate and learned choices that likely maximize reproductive success. To better understand nest-site selection in Arctic-breeding shorebirds, we are investigating how habitat type and availability, snow, and adult behavior influence individual choices.

A total of 2,324 shorebird nests, including Dunlin (*Calidris alpina*), Red Phalarope (*Phalaropus fulicarius*), Pectoral Sandpiper (*Calidris melanotos*), Semipalmated Sandpiper (*Calidris pusilla*), Long-billed Dowitcher (*Limnodromus scolopaceus*), and American Golden Plover (*Pluvialis dominica*), were located on four to six 36-ha study plots in Barrow, Alaska between 2003 and 2012. A geographically referenced vegetation and land cover map was used to identify the habitat surrounding nests (Craig Tweedie, University of Texas at El Paso). To estimate how snow cover may affect habitat availability, and thereby nest-site selection, we monitored snow melt on each study plot for three weeks during the 2012 field season. Daily snow-depth and water presence/absence measurements were collected with corresponding geographic coordinates at 2-m intervals along 7 repeated transects and 15 random once-sampled transects ($n=34,822$ data points). Measurements were geographically referenced to the vegetation and land cover map to develop temporal associations between land cover and snow presence/absence. Preliminary analyses of selected and available habitats indicate that most species were using drier habitats in greater proportion to their availability; the only exception was the Long-billed Dowitcher (Figure 1). We plan to develop a suite of *a priori* models to best predict habitat use by six shorebird species; models will be comprised of explanatory variables such as vegetation and landcover, conspecific and heterospecific population densities, and snow cover. We predict that increased densities of nomadic species may affect nest-site selection by pressuring con- or heterospecifics to use sub-optimal habitat. Similarly, we predict years with abundant snow cover or late melt offs may change habitat selection, depending on when a given species typically initiates (early versus late layers).

Additionally, we examined a marked population of Dunlin on these same plots to determine how mate fidelity and sex influence how far an individual moves its nest-site from year to year. Between 2003 and 2011, 481 Dunlin that nested on or near the study plots were banded with unique color combinations, and then sexed by genetics, size, and behavior. A portion of these were re-sighted in subsequent years. Records of individuals that nested in years i and $i + 1$ were compiled, with individuals assigned a class of 'faithful' or 'divorced,' depending on whether or not they reunited with their mate of the previous year. Distances between the nests of each individual in years i and $i + 1$ were measured in a geographic information system. Divorced

females moved farther to their new nest location in the subsequent year than both divorced males ($t = 2.00$, $df = 32$, $P = 0.027$) and faithful females ($t = 4.19$, $df = 38$, $P < 0.001$), and divorced males moved farther than faithful males ($t = 2.12$, $df = 37$, $P = 0.021$; Table 1, Figure 2). Future analyses will account for the effects of reproductive experience on movement, and will also be applied to Semipalmated Sandpipers.

Understanding which parameters influence nest-site selection in shorebird species breeding in the Arctic will allow us to infer how a shift in these parameters may in turn alter the distribution of these species. Such information is also helpful for predicting the distribution of shorebirds in areas not surveyed and for mitigating development.

Table 1.

Class	Sample size	Median (range) distance moved from previous nest-site (m)
Faithful female	26	72, (1 - 220)
Faithful male	19	79, (1 - 220)
Divorced female	14	333 (35 - 853)
Divorced male	20	147 (4 - 660)

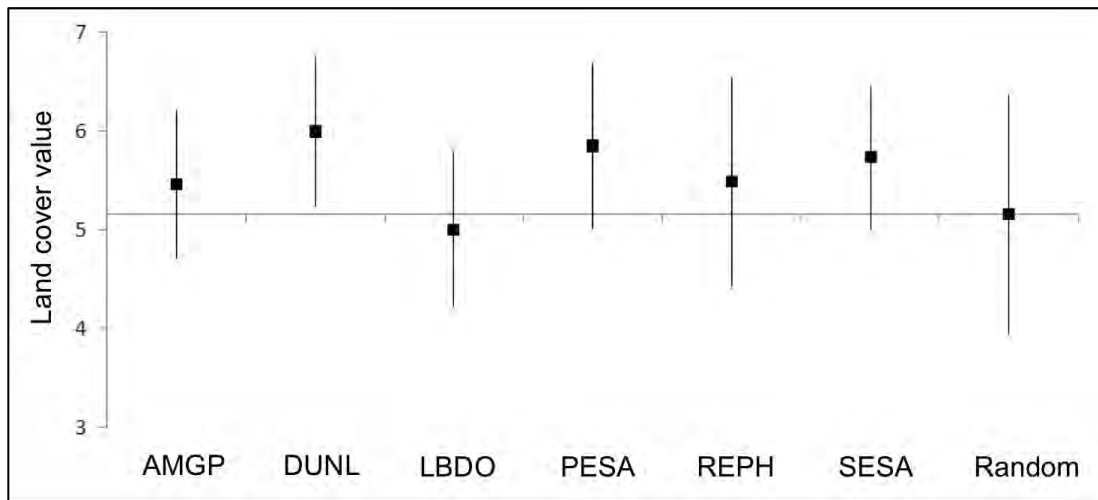


Figure 1. Mean land cover value and SD (whiskers) within 3 m of nests of six shorebird species. Land cover value indicates tundra moisture level and associated vegetation communities along a moisture gradient. Note that the axis is placed at the land cover value for random points, so observed values above the axis are drier than random locations and those below are wetter.

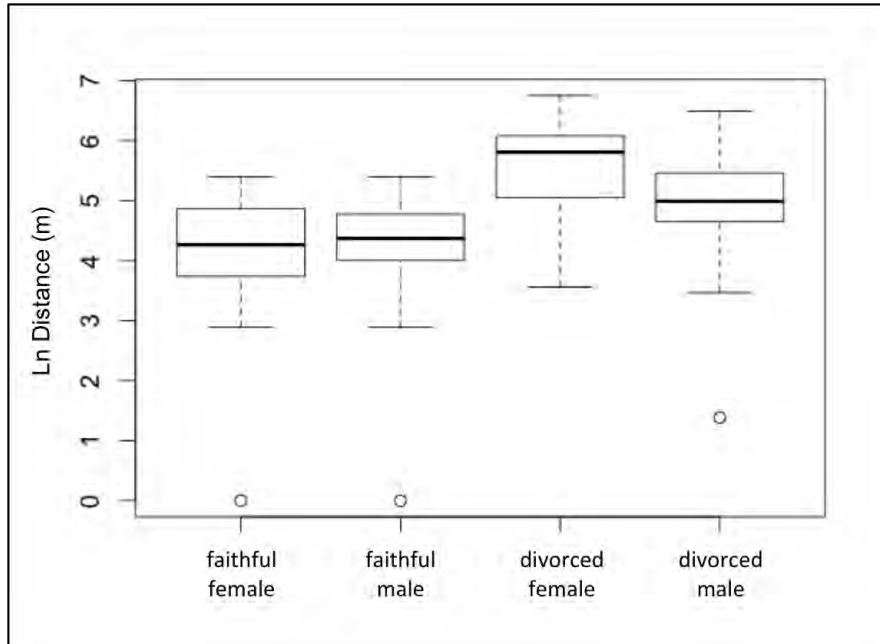


Figure 2. Natural log of distance moved from previous year's nest-site by each class of Dunlin. Whiskers represent ranges and boxes are quartiles and medians.

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#7 SHOREBIRDS OBSERVED ON MIDDLETON ISLAND, GULF OF ALASKA, DURING AUTUMN 2012

INVESTIGATORS: LUCAS DECICCO, CHARLES WRIGHT, NICHOLAS HAJDUKOVICH, JIM JOHNSON, U.S. FISH AND WILDLIFE SERVICE, MIGRATORY BIRD MANAGEMENT, ANCHORAGE, ALASKA AND DAVID TESSLER ALASKA DEPARTMENT OF FISH AND GAME, ANCHORAGE,

Located in the Gulf of Alaska, Middleton Island is 80 km south of the nearest point of land and represents a unique site to study the extent of trans-Gulf migration in many avian taxa. In autumn 2012, we conducted a second consecutive season of migration monitoring on this island. Personnel were present from 10 August to 10 October, one month longer than in 2011. Our primary focus was on passerine migration, but we also dedicated a substantial effort to monitoring all migratory birds on (e.g., waterfowl, shorebirds, raptors) and offshore (e.g., seabirds) the island. The information on shorebirds presented here is comprised of daily incidental observations, daily surveys of focal habitat types (e.g., freshwater marsh, estuarine meadows, saltwater marsh, saltwater lagoon), and coastal surveys. During three complete coastal surveys, the entire perimeter of Middleton Island was covered (ca. 25km) in approx. 5 hours. Because of our arrival in mid-August, it is likely that information on early migrants is

lacking. Nonetheless, these data comprise the most comprehensive inventory of migratory shorebirds on Middleton Island completed to date.

Thirty-five species and over 22,000 individual shorebirds were detected on Middleton Island during autumn 2012. Least Sandpiper, Pectoral Sandpiper, and Wilson's Snipe were the most numerous migrants, occurring in the hundreds per day during peak migration in suitable habitat. Many notable species were also observed, including: a single East Asian breeding Whimbrel (*N. p. variegatus*), two Bristle-thighed Curlews, a single juvenile Ruff, five Upland Sandpipers, three Buff-breasted Sandpipers and one adult Sharp-tailed Sandpiper. Below are species accounts summarizing the occurrence of all shorebird species recorded on Middleton Island during fall 2012.

Species Accounts:

Black-bellied Plover. First observed on 14 September when a single juvenile was seen at the northeastern saltwater lake, this bird remained through 16 September. One adult and three juveniles were observed on 23 September. All observations occurred in coastal cobble beach habitat.

American Golden-Plover. This species was first observed on 20 August when 3 were seen, two were present on 28 August, singles were seen on 1, 4, 5, 7, 8, 13, and 17 September, and two birds were observed on 21 September, marking our last detection of this species. All American Golden-Plovers seen in 2012 were juveniles, although adults may have been overlooked due to presumed identification difficulties presented by adults in heavy molt.

Pacific Golden-Plover. Between 10 and 80 birds were detected daily from our arrival on 10 August through 21 September when numbers decreased noticeably. From this date through 30 September fewer than 10 birds per day were observed. A flock of approximately 60 birds was seen on 3 and 4 October, marking our latest detection of this species. Exclusively adults were detected upon our arrival through 20 August when the first juvenile was seen. The ratio of juveniles to adults increased from this date on, with ca. 25% juveniles observed on 28 August. By early September the flock was dominated by juvenile birds (90-100%) the last adult was observed on 21 September.

Semipalmated Plover. Adults and freshly fledged juveniles were present upon our arrival on 10 August; we assumed these were local breeders/young. It was not until 21 August that additional individuals were detected. This species was seen on 16 days between 21 August and 19 September with peak numbers detected between 26 August and 3 September. Seventy individuals were seen on 26 and 27 August in the northeastern saltwater lake and a total of 45 individuals were detected on 3 September when the entire coastline was surveyed. Our latest observation of this species occurred on 29 September.

Black Oystercatcher. Based on our three coastal surveys (3 September, 21 September, and 4 October) we detected a decrease in numbers of this species with 536, 303, and 117 individuals detected respectively. During these surveys, very close to, if not the entire Middleton population was detected. Very few juveniles were observed, suggesting low production during the 2012 breeding season.

Spotted Sandpiper. This species was encountered daily in small numbers from our arrival on 10 August through 4 September. Maximum daily count of 10 birds occurred on 16 August, numbers decreased towards early September. The vast majority of birds observed were juveniles, with only small numbers of adults seen during mid-August. This species was not observed after 8 September.

Solitary Sandpiper. This species was detected nearly daily between 10 August and 1 September, with a maximum count of four individuals on 18 August. After 1 September this species was not detected apart from at least one, and possibly two, extremely late individuals seen on four occasions between 29 September and 4 October. All observations were of single birds in small fresh-water bodies of water. All birds seen well or photographed were juveniles.

Wandering Tattler. A common fall migrant, this species was most abundant between 10 August and 5 September when upwards of 50 birds were seen daily. After 5 September the species began to decrease in numbers with fewer than 25 observed daily through 21 September. Detections became intermittent after this date and numbers decreased to one or two birds per day, with the last individual being seen on 4 October. Results of our three full coastal surveys are as follows: 67 individuals on 3 September, 26 on 21 September, and two on 4 October. No large concentrations were noted and the species seemed to be evenly spread along all suitable coastal habitats. All birds seen well or photographed were juveniles, although adults were likely overlooked.

Greater Yellowlegs. Detected throughout our stay, this species showed no apparent temporal patterns in its abundance on Middleton Island. Detected daily with numbers generally less than 30 per day, peak counts of 40 or more individuals occurred on 21 and 27 August, 1, 3, 5, 7, 17, and 29 September, and 6 October. Our highest counts occurred on 3 September and 21 September with 75 and 84 individuals seen, respectively. Adults were observed early in the season while only juveniles were detected later; exact dates are not available. Both fresh and salt-water wetlands and coastal habitat were utilized by this species.

Lesser Yellowlegs. Observed daily between 10 August and 5 September, this species was most common from 10 to 27 August when daily totals averaged ca. 15 individuals. Maxima of 35 and 34 individuals occurred on 10 and 17 August, respectively. After 27 August fewer than six individuals were observed nearly each day and by 3 September the species was observed intermittently in small numbers through 23 September. A single late individual was seen on 4 October. This species was found in both freshwater marsh and coastal saltwater habitat.

Upland Sandpiper. Seven individuals were detected in autumn 2012. First detected on 12 August when a single bird was observed flying over the island, four individuals were observed on 14 August (one at the north point and three together along the runway), a single bird was observed along the road near the FAA housing on 1 and 2 September and a second bird was seen at the north point on 2 September.

Whimbrel. This species was detected daily from 10 August through 11 September, after which detections became more intermittent but continued in small numbers through 10 October. A notable peak was not detected, although highest counts occurred in the last half of August through the first week of September. Between two and 10 individuals were detected, with exceptional high counts of 22 birds on 17 August and 14 on 3 September. All birds observed

well or photographed were juveniles and of the *hudsonicus* subspecies. A single adult of the East Asian *variagatus* subspecies was detected regularly from 29 August through 5 September associated with a group of *hudsonicus* Whimbrel. Photos in flight were obtained and the lighter plumage extending from the rump through the mid back was apparent.

Bristle-thighed Curlew. Two individuals were detected. The first was photographed as it arrived from the northwest over the north point on 4 September and a second individual was seen associated with a Whimbrel on 21 September.

Marbled Godwit. Two individuals were seen on 30 September.

Ruddy Turnstone. This species was detected intermittently, on ca. 30% of field days, throughout our stay. Generally small numbers were seen with fewer than 10 individuals per day, with the exceptions of 38 on 3 September and 20 on 17 September.

Black Turnstone. One of the most common shorebird species occurring in autumn on Middleton Island, this species was detected consistently throughout our stay. Daily numbers varied greatly, which could be attributable to survey effort and tide patterns. Our complete coastal survey on 3 and 21 September and 4 October produced 768, 507, and 702 individuals respectively.

Surfbird. Small numbers were detected inconsistently throughout our stay, decreasing in abundance as the autumn progressed. On our full coastal surveys 210 individuals were detected on 3 September, 31 on 21 September and 10 on 4 October. Most birds were seen along the rocky shorelines of the island associated with Black Turnstones and Rock Sandpipers.

Red Knot. Three individuals were detected. An adult was photographed on 20 August at the north point, a single juvenile was seen on the west coast on 24 August and a single adult was observed on 1 and 5 September along the northeast coast.

Sanderling. This species appeared to form a single large flock on Middleton Island during fall 2012. Fifty to 100 individuals were often detected at the northeast point of the Island. Results of the full coastal surveys are as follows: 507 birds on 3 September (ca. 20% juvenile), 168 on 21 September (ca. 40% juvenile), and 56 on 4 October (no notes on age proportions).

Semipalmated Sandpiper. Seven individuals were detected; all individuals observed well were juveniles. Singles were seen on 17, 20, 27 August, and 1 September, three birds were seen on 29 August.

Western Sandpiper. This species was detected intermittently between 11 and 22 August with a maximum of six birds seen on 16 August. Between 20 August and the end of September the species was detected daily when appropriate habitat was visited. During the full coastal surveys 282 individuals were seen on 3 September, 206 on 21 September, and 5 on 4 October; after the 4th of October the species was not detected. A single adult was photographed on 25 August, all other individuals observed well or photographed were juveniles.

Least Sandpiper. One of the most common shorebirds during autumn on Middleton Island, this species was a notable early migrant, with peak numbers occurring between 10 and 27 August when daily counts between 100 and 200 individuals were not uncommon. Data from our full

coastal surveys are as follows: 100 individuals on 3 September, 5 on 21 September, and 1 on 4 October. Fewer than 15 individuals were detected on a daily basis between 7 and 14 September and singles or very small groups (<5 individuals) were observed occasionally through 4 October, which were our last observations of this species.

Baird's Sandpiper. Three individuals were detected. A single bird was photographed on 11 August, a juvenile was observed and photographed on 26 and 27 August, and another was seen on 21 September.

Pectoral Sandpiper. Only one individual was detected before 20 August; after this date the species steadily increased and became most common between 27 August and 21 September. Maximum numbers occurred on 1 September when over 500 individuals were estimated in a single bay. Full coastal survey data for this species are as follows: 366 individuals on 3 September, 344 on 21 September, and 45 on 4 October. Numbers decreased noticeably after 26 September and the last individual was observed on 9 October.

Sharp-tailed Sandpiper. First detected on 25 August when a single bird was seen. From 25 August through 1 October the species was detected on 13 occasions in small numbers (<5). A notable count of eight individuals on 3 September represented our peak in numbers. An adult was observed and photographed on 26 and 27 August; all other individuals were juveniles.

Rock Sandpiper. This species generally formed a single large flock that resided on the eastern and southern coastlines. This flock numbered 344 on 3 September, 220 on 21 September, and 278 on 4 October. Upon our arrival and through mid-September the flock was comprised of primarily adults and all were in heavy body and flight feather molt. By late-September most adults had attained basic plumage. Few juveniles were observed.

Dunlin. A late migrant, the first individual was detected on 7 September, after which small numbers were observed daily between 9 and 29 September. Maximum counts occurred on 21 and 27 September with eight and 10 birds detected, respectively. Only one adult was detected.

Stilt Sandpiper. This species was seen in groups of two or three individuals on six occasions between 24 August and 2 September, with a maximum of six individuals observed on 25 August. All individuals seen well were juveniles.

Buff-breasted Sandpiper. Three individuals were detected. First observed on 27 August when a single bird was found on the grassy runway, a second bird was seen in the same area between 2 and 9 September. A third bird was found in coastal habitat on 21 September.

Ruff. A single juvenile seen (and photographed) on 26 August was associated with a small flock of Pectoral Sandpipers on the northeast saltwater pond.

Short-billed Dowitcher. Detected on 6 days between 16 August and 1 September with maximum day counts of 9 and 8 individuals on 26 August and 1 September, respectively. A single bird was observed on 30 September and 1 October.

Long-billed Dowitcher. This species was detected on ca. 70% of field days between 10 August and 14 September, with a maximum count of 17 individuals on 7 September. After this date the species became more numerous and was detected on nearly every field day in numbers >10

individuals. A peak in migration appeared between 21 September and 3 October when between 20 and 100 birds were seen daily, with an exceptionally high count of 217 individuals occurring on 21 September.

Wilson's Snipe. This species was common throughout our stay, with base detections of 20 to 60 birds per day. Largest numbers were seen from 29 August to 1 September with over 100 individuals estimated per day; another peak occurred at the end of September. During peak numbers, one would occasionally flush flocks of 40 to 60 birds from particularly choice habitats. Numbers decreased during the last days of our stay.

Red-necked Phalarope. This species was detected nearly daily through mid-September with most individuals observed flying over the ocean from the northwest point. Daily counts varied from singles to 80 individuals. A peak in numbers was observed between 4 and 8 September when between 100 and 320 (6 September) were noted daily. This species was not detected after 28 September.

Red Phalarope. Single individuals of this species were detected from the northwest point on 28 August, 8, 11, and 14 September. A concentration of 12 birds was observed on 23 September foraging with Red-necked Phalaropes in surf.

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#8 ESTIMATING TEMPORAL MOVEMENTS OF A MIGRATORY SPECIES USING STABLE CARBON ISOTOPES

INVESTIGATORS: ANDY DOLL AND MIKE WUNDER, UNIVERSITY OF COLORADO, DENVER, RICHARD B. LANCTOT, U.S. FISH AND WILDLIFE SERVICE, AND CRAIG STRICKER, U.S. GEOLOGICAL SURVEY

The Dunlin (*Calidris alpina arctica*) is a long distance migratory shorebird that breeds in terrestrial environments in the high Arctic and winters in coastal environments in temperate and equatorial zones. This change in habitat (and diet) allows us to use isotopic methods to estimate when individual Dunlin diet switch from a marine to a terrestrial environment, which if sampled on the breeding grounds can be interpreted as time since arrival. Isotopic methods are useful here because their diet is relatively enriched in ^{13}C during winter and depleted in summer. Estimating arrival times is of interest because the temporal window for breeding is narrow and breeding success is generally maximized when nests hatch just prior to the seasonal peak in arthropod abundances. We used a simple recapture procedure to estimate the $\delta^{13}\text{C}$ blood turnover rates experienced by a wild population of Dunlin in a natural, *in-situ* environment at Barrow,

Alaska, in 2010 and 2011. We estimated dates of diet-switch using *in-situ* turnover rate estimates, and compared these to dates determined from a model using experimentally and theoretically derived turnover rates. The *in-situ* blood $\delta^{13}\text{C}$ turnover rate (beta mean: 0.0941; 95% CI: 0.0470 to 0.1553) was higher than both the experimentally determined estimate (beta mean: 0.0665; 95% CI: 0.0313 - 0.1137; Evans-Ogden *et al.* 2004) and the turnover rate determined from allometric theory (beta mean: 0.0722; 95% CI: 0.0684 - 0.0761; Carleton and Martínez del Rio 2005). This difference is likely due to increased metabolic demands associated with post-migration tissue repair and reproduction for our study population. Using the *in-situ* turnover rate, the median diet-switch date estimate for 2010 was June 4. 2010 was a late spring and this diet-switch estimate occurred two days prior to the initial snowmelt at the study site when suitable foraging conditions were not available. This indicates that an unknown terrestrial feeding location was used prior to arrival in Barrow. The lag-time between an individual's diet-switch date and their individual nest initiation date was 9 days (± 4.4 median absolute deviation [MAD]). In 2011 the median diet-switch date estimate was June 9th. With the snowmelt occurring on May 29th, this suggests that conditions were favourable for the birds to migrate directly to the breeding grounds without utilizing terrestrial feeding locations on route. Assuming that in 2011 these diet-switch dates correspond with arrival at the breeding ground, our results indicate that the lag-time between arrival and nest initiation is 3 days (± 3 MAD). The methods implemented here demonstrate how to assess the *in-situ* isotopic turnover rates of a wild population. Our results support the theory that stable isotope techniques provide a minimally invasive approach for determining the phenology of migration events on an individual level.

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#9 ECOLOGY AND EVOLUTION OF REPRODUCTIVE TACTICS IN RED-NECKED PHALAROPES

INVESTIGATORS: WILLOW ENGLISH AND DAVID B. LANK, SIMON FRASER
UNIVERSITY

2012 was the second year of a study on the evolution and ecology of reproduction in Red-necked Phalaropes. As in the previous year, we arrived in mid-May and worked on the same 2 km² region of boggy tundra near Nome, Alaska where SFU crews have worked since 1993. The data from this project, as well as the WESA/SESA sandpiper project that is run on the same site, were submitted to the Arctic Shorebird Demographic Network.

We started the season with mistnetting, and caught 53 individuals, of which 5 were recaptures from previous years (2010 & 2011). In 2012 we once again doubled the number of nests found in the previous year, with 98 nests with a total of 361 eggs found compared to 50 nests in 2011. We collected 6 fresh eggs of known age for use in a rapid yolk deposition study. We caught an additional 61 males during nesting, of which 14 were recaptures from previous years. In total,

we caught 117 birds, and took 90 blood samples, 98 feather samples and 10 fecal samples. These samples were collected either for ASDN side projects or for the ASDN genetic library. As in 2011, many of the nests were monitored using HOBO temperature sensors and data loggers. The temperature data will show the length and frequency of incubation bouts and recesses. Nests with this equipment were protected by predator exclosures due to their greater visibility. We had 69 nests where at least one chick hatched. We banded, took morphometric measurements and blood sampled 196 chicks. Eggs that did not hatch or that were abandoned were collected and will be dissected to determine presence of an embryo. Tissue samples from failed embryos and blood samples from chicks will be analyzed to determine sex.

We had a very successful season, and look forward to using the data collected to answer questions about the evolution of mating strategies and reproductive traits in this sex-role reversed species. The Masters thesis written using this data will focus on 1) the evolution of relatively small eggs in polyandrous species, and how this relates to incubation ability in males, 2) sex ratio of offspring, and possible relationships with embryo mortality and chick morphometrics, and 3) rapid yolk and the possibility that small eggs are a time-saving strategy.

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Adult male Red-necked Phalarope and chick exploring their territory right after hatch at Nome, July 2012. Photo by W. English.

#10 QUANTIFYING MERCURY EXPOSURE IN NORTH AMERICAN ARCTIC BREEDING SHOREBIRDS

INVESTIGATORS: DAVE EVERS AND IAIN STENHOUSE, BIODIVERSITY RESEARCH INSTITUTE

Mercury (Hg) contamination in the Arctic and in Arctic wildlife has become a major concern; recent studies indicate that the coincidence of long-range transport of atmospheric mercury and unique features of the Arctic environment results in greater Hg deposition, compared with sub-Arctic or more temperate environments (AMAP 2011, Poissant et al. 2008). Chronic exposure to Hg can cause sub-lethal effects in birds, including impaired physiology, behavior, and reproductive success, that can ultimately have population level effects (Evers et al. 2008). Traditionally, studies investigating adverse effects of Hg to birds have largely focused on fish-eating species due to the accumulation of Hg and production of methylmercury (MeHg) in aquatic environments (Evers et al. 2008, Seewagen 2009). Recent studies, however, have also shown negative effects of Hg on terrestrial avian insectivores (Hallinger et al. 2011, Jackson et al. 2011).

We hypothesize that Arctic-breeding shorebirds, also invertivores, are exposed to MeHg through the local food web at levels that may impair health and ultimately have adverse effects on populations. Shorebirds may be at increased risk of MeHg exposure due to the high rate of Hg methylation that occurs in coastal wetlands (Fitzgerald et al. 2007). Contaminant exposure has already been identified as one of five leading factors that may be limiting shorebird populations (Butler et al. 2004), but the degree to which Hg contamination may be contributing to reduced reproductive success and population declines has not been well studied. Preliminary research at Barrow, AK, in 2008 and 2009 (Perkins et al. *in prep*) revealed blood Hg concentrations as high as 2.20 $\mu\text{g/g}$ (ww), with a mean of $0.95 \pm 0.62 \mu\text{g/g}$ (ww; $n = 16$), in Semipalmated Sandpipers (*Calidris pusilla*). Similarly, Pectoral Sandpipers (*Calidris melanotos*) sampled at Barrow had elevated blood Hg levels (max = 1.90 $\mu\text{g/g}$; ww), mean \pm SD = $0.68 \pm 0.66 \mu\text{g/g}$ (ww; $n = 6$).

The Biodiversity Research Institute (BRI) and the Arctic Shorebird Demographics Network (ASDN) have initiated a collaborative study to establish baseline Hg concentrations for multiple species of Arctic-breeding shorebirds and evaluate the risk of Hg exposure across a large geographic range. BRI has recently begun analyzing the 1,257 samples collected during the 2012 breeding season from eight field sites across the ASDN network. Samples were collected from 11 species; Black-bellied Plover (*Pluvialis squatarola*), American Golden Plover (*Pluvialis dominica*), Ruddy Turnstone (*Arenaria interpres*), Black Turnstone (*Arenaria melanocephala*), Semipalmated Sandpiper, Western Sandpiper (*Calidris mauri*), Pectoral Sandpiper, Dunlin (*Calidris alpina*), Long-billed Dowitcher (*Limnodromus scolopaceus*), Red-necked Phalarope (*Phalaropus lobatus*), and Red Phalarope (*Phalaropus fulicarius*; Table 1).

Sample collection will continue in 2013. We will contrast values with data from prior years to examine temporal trends in Hg exposure.

Table 1: Numbers of tissue samples collected from 8 ASDN field locations. Blood and feather samples were collected from 11 shorebird species; for each location top numbers indicate the number of feather samples for each species and bottom numbers indicate blood samples. Standard four letter codes following AOU nomenclature indicate Species in the left hand column. Participating ASDN site names have been shortened as follows; NOME (Nome), CAKR (Cape Krusenstern), BARR (Barrow), IKPI (Ikpikpuk), COLV (Colville), MACK (Mackenzie River Delta), EABA (Southampton Island), and BYLO (Bylot Island).

Species	NOME	CAKR	BARR	IKPI	COLV	MACK	EABA	BYLO	Total
									Feather
									Total Blood
BBPL	-	-	-	-	-	-	6	-	6
	-	-	-	-	-	-	6	-	6
AMGP	-	-	21	-	-	-	-	26	47
	-	-	20	-	-	-	-	23	43
RUTU	-	-	-	-	-	-	13	-	13
	-	-	-	-	-	-	13	-	13
BLTU	-	14	-	-	-	-	-	-	14
	-	15	-	-	-	-	-	-	15
SESA	38	33	55	47	14	17	-	-	204
	21	33	34	47	14	16	-	-	165
WESA	37	29	19	-	-	-	-	-	85
	20	29	17	-	-	-	-	-	66
PESA	7	-	40	-	-	-	-	-	47
	5	-	34	-	-	-	-	-	39
DUNL	1	13	34	21	12	-	-	-	81
	1	13	32	21	12	-	-	-	79
LBDO	-	-	24	-	-	-	-	-	24
	-	-	23	-	-	-	-	-	23
REPH	-	-	51	19	13	-	-	-	83
	-	-	36	19	13	-	-	-	68
RNPH	34	9	12	-	-	0	-	-	55
	16	10	10	-	-	15	-	-	51
Total									674
									583

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#11 BREEDING ECOLOGY OF SHOREBIRDS AND SURVEY OF OTHER BIRDS AT CAPE KRUSENSTERN NATIONAL MONUMENT, ALASKA

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In 2012, we completed our second year of study for the Arctic Shorebird Demographics Network (ASDN) at Cape Krusenstern. This also marked the third year of field work in general at our site. We conducted nest searching, banding and environmental monitoring activities between 19 May and 8 July 2012 during which time we found 146 nests of 7 shorebirds species, including Black-bellied Plover (new in 2012), Western Sandpiper, Semipalmated Sandpiper, Dunlin, Red-necked Phalarope, Long-billed Dowitcher (new in 2012) and Black Turnstone.

We determined nest initiation dates for shorebird nests by observing clutch completion, by using egg floatation regression equations or back-calculating from hatch date. Mean initiation date for Dunlin was 6 June \pm 5.0d ($n = 22$, 31 May- 21 June); Semipalmated Sandpiper 8 June \pm 3.6d ($n = 55$, 29 May – 19 June); Western Sandpiper 10 June \pm 5.2d ($n = 35$, 2 June – 26 June); Black Turnstone 2 June \pm 3.5d ($n = 14$, 27 May - 8 June); and Red-necked Phalarope 11 June \pm 4.0d ($n = 18$, 4 June- 22 June). We found one nest each of Black-bellied Plover (found outside the plot boundaries and initiation date was not determined) and Long-billed Dowitcher within the study plot (nest initiated 6 June). Average initiation dates were later for all Calidrids (i.e. sandpipers) in 2012 compared with 2011. Further, initiation dates were later by 3 days for Dunlin, 6 days for Semipalmated Sandpiper, 3 days for Western Sandpiper and earlier by 3 days for Red-necked Phalarope. We were unable to determine the fate of approximately 14% of the monitored nests. These consisted mostly of Black Turnstones that nested away from our main study area. For nests where fate was determined, Dunlin ($n = 20$) showed the highest apparent hatch success of 75% followed by Western Sandpiper (74 %, $n=31$), Semipalmated Sandpiper (69%, $n=51$) and Red-necked Phalarope (50 %, $n = 18$). Overall, apparent nest success declined in 2012 when compared to 2011.

We captured and uniquely marked 155 individual shorebirds with engraved flags and/or color bands, including 16 Dunlin, 49 Western Sandpiper, 59 Semipalmated Sandpiper, 17 Black Turnstone, 1 Long-billed Dowitcher and 13 Red-necked Phalarope. There was a marked increase in the proportion of after hatch year versus second year (SY) captures in Dunlin (50% SY), Western Sandpiper (37% SY) and Semipalmated Sandpiper (17% SY). All captured birds were morphologically measured and had genetic, feather, fecal and avian health samples collected.

In addition to the shorebird work, we conducted frequent (every 3 days) predator surveys, terrestrial and aquatic food resource collections, surface cover surveys and collected hourly weather conditions. We participated in a number of ASDN side-projects, including pond hydrology study, Methyl mercury exposure in shorebirds (see Evers et al. summary), avian

malaria (see Wisley et al. summary) and gut micro biota (see Grond et al. summary). We also participated in the third year of a broad scale Dunlin migratory connectivity study by recapturing three individuals equipped with light-level geolocators (totaling 50% recovery rate in two years).

We also tallied the number of birds of all species observed by researchers each day. In total, we documented 60 species of birds in the study area including 25,221 individuals. Our most abundant observations included (>1,000 observations): Glaucous Gull, Tundra Swan, Semipalmated and Western Sandpiper, Dunlin, Lapland Longspur, Arctic Tern, Red-necked Phalarope, Long-tailed Duck, and Northern Pintail. Our most common migrants or local breeders (5 – 10 individuals/ day and >150 individuals/season) included American Golden-plover, Bar-tailed Godwit, Long-billed Dowitcher, Pectoral Sandpiper, Greater White-fronted, Canada and Snow Goose, Black Brant, Green-winged Teal, Greater Scaup, Pacific Loon, Canvasback, Red-breasted Merganser, Sandhill Crane and Parasitic and Pomarine Jaegers. Our most uncommon observations included (< 5 observations): Pacific Golden-plover (11, 12 and 16 June), Blue-winged Teal (27 May), Herring Gull (20 June), Bank Swallow (17 June) Peregrine Falcon (2 June), Bristle-thighed Curlew (30 May and 1 June), Stilt Sandpiper (6 June), Rough-legged Hawk (11 June), Northern Harrier (3 June) and Grey-cheeked Thrush (1 – 3 June).

Besides the breeding shorebirds, we confirmed the breeding status of an additional 17 bird species including: Tundra Swan, Green-winged Teal (new in 2012), Greater Scaup (new in 2012), Northern Pintail, Common Eider, Long-tailed Duck, Pacific Loon, Mew and Glaucous Gull, Arctic Tern, Sandhill Crane, Parasitic Jaeger, Willow Ptarmigan, Lapland Longspur, Eastern Yellow Wagtail (new in 2012), Common Redpoll (new in 2012) and Savannah Sparrow.

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The fierce adult male Red-necked Phalarope staring down Emilie D’Astous, his handler, at Cape Krusenstern, June 2012. E. D’Astous/USFWS.

#12 LINKING GUT MICROBIOTA COMPOSITION TO DEVELOPMENT AND LIFE-HISTORY TRAITS IN MIGRATORY SHOREBIRDS

INVESTIGATORS: KIRSTEN GROND AND BRETT K. SANDERCOCK, KANSAS STATE UNIVERSITY, RICHARD B. LANCTOT, U.S. FISH AND WILDLIFE SERVICE, JORGE SANTO DOMINGO AND HODON RYU, U.S. ENVIRONMENTAL PROTECTION AGENCY, MEHDI KEDDACHE, CHILDREN'S HOSPITAL RESEARCH FOUNDATION, STEPHEN YEZERINAC, MOUNT ALLISON UNIVERSITY, AND ARCTIC SHOREBIRD DEMOGRAPHICS NETWORK COLLABORATORS.

Little is known about the microbial fauna of the avian gastro-intestinal tract and about how microbial communities affect avian health and are in turn altered by behavioral and physiological characteristics of the birds themselves. Despite the large effort involved in identifying gut microbiota of mammals, only nine avian taxa in total have so far been investigated using 16S rRNA sequence analysis. Shorebirds are long-distance migrants use many latitudinal different habitats during their annual cycle and as a result are exposed to different microbial environments and food sources that have the potential to influence and alter their gut microbial composition. Variation in life history characteristics makes shorebirds an excellent study group to look at the effect of differences in habitat use and migration behavior on gut microbial composition. The relationship between these factors and microbiota is especially important with regard to current declines in shorebird numbers, as changes in habitat use and migration pathways could alter gut microbiota and affect shorebird health.

Over 630 fecal samples were collected in 2011, and DNA was extracted using the MoBio PowerLyzer kit. Since last year's report, several different PCR and qPCR assays have been conducted on 587 fecal samples of 10 species to determine the occurrence of known fecal bacteria. Results show that especially the *Bacteroidetes* phylum of Eubacteria is well represented in shorebirds with 87.9% of samples positive. Also, *Enterococcus* spp. were present in over half (55.1%) of the samples and species specific assays showed that *Enterococcus faecalis*, *Enterococcus faecium*, and *Enterococcus casseliflavus* had 13, 0.5 and 0%, respectively, of the samples had positive detections. In addition, selected fecal samples (300-500), including 48 samples of Dunlin equipped with geolocators, will be used to generate 16S rRNA clone libraries using the Illumina MiSeq platform. Using the Illumina approach we expect to analyze between 3,000 and 10,000 sequences per sample, resulting in ~2.5 million sequences that can be used to describe the predominant bacterial taxa associated with each shorebird species.

In 2012, additional fecal samples were collected by personnel at Arctic Demographic Shorebird Network sites. This year's sampling focused on collecting up to 10 fecal samples of all species breeding at the different sites and in addition collecting fecal samples from all recaptures. Recaptures were sampled to enable us to investigate annual trends in microbiota composition within individuals and, if the same effort will be applied next year, could potentially elucidate the effect of age-specific changes on gut microbiota. A total of 410 new fecal samples were collected belonging to 10 species, including over 40 recaptures that were sampled in 2011. Using

these samples, Grond (PhD candidate) will address these research questions: 1) how do gut microbiota of migratory shorebirds develop throughout their life-time and 2) does inter and intra-specific differences in life-history characteristics of different shorebird species influence their microbial composition and can these results be linked to different rates of species decline. Samples collected in 2011, 2012 and future seasons will all be analyzed to answer these questions. Our proposed project largest and most in-depth study aimed at investigating gut microbiota of migratory birds.

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#13 WHIMBREL BREEDING ECOLOGY NEAR KANUTI LAKE, KANUTI NATIONAL WILDLIFE REFUGE, 2012.

INVESTIGATORS: CHRISTOPHER HARWOOD, U.S. FISH AND WILDLIFE
SERVICE AND UNIVERSITY OF ALASKA FAIRBANKS AND ABBY POWELL,
U. S. GEOLOGICAL SURVEY

2012 was the fifth consecutive year documenting breeding Whimbrels (*Numenius phaeopus*) at Kanuti NWR. Discovery in 2011 of a second breeding population resulted in monitoring breeding at 2 sites (Kanuti Lake, Everglades) in 2011–2012.

At the Kanuti Lake site, we detected the first Whimbrels on 7 May. We resighted 3 (2 males) of 4 adults marked in 2011, 5 (3 males) of 11 marked in 2010, and 2 (both female) of 21 marked in 2009, including one with an implanted PTT (our first resighting of a PTT bird in 2 years). We confirmed nesting for 80% of the marked birds, 6 of which mated with other marked birds. Marked males defended and nested in the same territories used in prior years. Two adult males were captured and newly marked (uniquely coded green flags) near Kanuti Lake in 2012.

At the Everglades site, we were unable to access the area until 18–21 May; we resighted 10 (8 male) of 16 (11 male) individuals marked in 2011 during this time period. We observed one additional marked male on 11 June. At least 7 of the 9 males resighted were confirmed to nest in the area; both returning marked females nested, one with her 2011 mate. Males generally occupied the same territories as in 2011, although one seemingly took over his non-returning neighbor's territory (or enlarged his own) and mated with said neighbor's mate from 2011. A second marked male attempted to defend his 2011 nesting area for a couple weeks before being seemingly displaced by competitors. Five adults (4 male) were captured and newly marked at the Everglades.

We located 22 nests total within the 2 study areas. We found 10 nests at Kanuti Lake (vs. ≥ 19 , 14, and 6 nests in 2009, 2010, and 2011, respectively), all of which were located < 500 m from nests found in 2009–2011; 40% of these nests hatched (4 depredated, 2 abandoned). One late 3-egg nest (possibly a re-nesting attempt) was located only 60 m from its nearest neighbor, perhaps the smallest inter-nest distance ever recorded for the species. We found 12 nests at the Everglades (vs. 11 in 2011, although ≥ 14 breeding pairs were suspected); only one failed (depredated).

Nest initiation at the 2 sites spanned ≥ 13 days. Based on backdating using a 26-day incubation period, nest initiation likely began on 19 May and ended on 31 May. We found the first nest (Everglades) on 20 May, and the latest (Kanuti Lake) on 1 June. Observed hatch was from 13–21 June (16 June average and median date). The 2 abandoned nests were expected to hatch between 25–27 June and thus may have represented re-nesting attempts. We estimated nest survival based on a constant daily survival rate over a 28-day nest exposure period at 57% (95% CI: 31–76%).

As in 2011, we collected data on multiple habitat features around Whimbrel nests and random non-nest sites to explore the relationship of nest site selection and habitat associations. These data will be analyzed during the coming year.

Finally, Chris Harwood was awarded the University of Alaska Foundation's Angus Gavin Migratory Bird Research Grant in spring 2012. This will help fund the identification of additional Whimbrel breeding areas in interior Alaska outside of Kanuti NWR. This survey will likely target road-accessible areas due to funding constraints and is scheduled for May–June 2013.

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An adult Whimbrel incubating its nest at Kanuti Wildlife Refuge, June 2012. Photo by C. Harwood.

#14 BANDING AND MONITORING STUDY OF RUDDY TURNSTONES ON THE COLVILLE RIVER DELTA, ALASKA: 1964 TO PRESENT.

INVESTIGATOR: JAMES HELMERICKS, GOLDEN PLOVER GUIDING CO.

Spring migration data on Ruddy Turnstones (*Arenaria interpres*) has been recorded at the Helmericks' Colville River Delta, Alaska Banding Station from 1964 to 2012. In 1983 the monitoring program was expanded to include banding birds with USFWS bands. In 1987 the banding program was changed to include a color banding system to allow for individual color codes. Study objectives include attempting to determine where North Slope Ruddy turnstones migrate for winter, summer and wintering site fidelity, age data, and the timing of spring arrivals in relation to snow conditions and breakup dates for the Colville Delta.

Since 1987, 525 ruddy turnstones have been banded with color codes. Celluloid and darvic color bands were deployed until 2011, but it was determined that identifications of banded birds were hindered by rapid fading and frequent loss of the bands. Therefore, in 2011, a more robust engraved tarsus band was substituted. These bands are expected to have a lifespan of at least 20 years, and allow for easier and more accurate identification in the field.

The data collected shows that populations of turnstones that use the habitat around the Colville River Delta, Alaska's banding station winter in Southern CA (most sightings), Baja California Sur, Mexico, and one bird from French Guiana. The most recent sighting was a bird banded in 2011 with the new engraved tarsus band. It was seen in Puerto Viejo, Mexico, the same location as the first returned code from that country, in 1998. The data suggests that some birds winter in the same location, sometimes even the same beach, in successive winters.

In 2012, in cooperation with David Ward at the Alaska Science Center, I was able to attach a few geolocators on some of our Colville birds. Once the geolocators are collected from returning birds in 2013, we should have a better feel for how our turnstones are migrating out of the Arctic and if other areas besides southern California and northern Mexico are being used for wintering. We will also be able to see how quickly they move to and from the Arctic nesting areas.

Data sets of at least 10 years duration on turnstones returning to the Colville Delta breeding grounds have been collected on over 30 individuals. The current age record is 17 years. Even though spring migration arrival times have been remarkably consistent over the past 48 years, arrival dates have trended a few days earlier. Over the past four decades the average arrival has moved from the 20th to 16th of May. The largest increase was between the 80's and 90's. This change doesn't correlate with documented changes in the timing of breakup or snow melt on the Colville, so perhaps is an indication that warmer weather further south is causing turnstones to migrate sooner.

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#15 BREEDING ECOLOGY, MIGRATORY CONNECTIVITY, AND AVIAN INFLUENZA VIRUS SEROPREVALENCE OF ALASKAN RED KNOTS (*CALIDRIS CANUTUS ROSELAARI*), 2012

INVESTIGATORS: JIM JOHNSON, LUKE DECICCO, NICK HAJDUKOVICH, AND RICK LANCTOT, U.S. FISH AND WILDLIFE SERVICE, MIGRATORY BIRD MANAGEMENT; DAN RUTHRAUFF AND JEFF HALL, U.S. GEOLOGICAL SURVEY.

The 2012 field season marked our third consecutive year of studying aspects of Red Knot (*Calidris canutus roselaari*) ecology on the Seward Peninsula. A team of 3–9 personnel were hard at work on study sites near the Nome road system from 15 May to 7 July.

Our primary objectives were to: 1) retrieve light-level geolocators attached to adults during 2010 and 2011 to determine migratory connectivity; 2) individually mark birds so that adult survival could be ascertained and they were available for resighting at non-breeding areas; 3) locate and monitor nests to describe site characteristics, chronology, and nest success, and 4) collect biosamples to assess prevalence of active avian influenza virus (AIV) infection and determine AIV exposure history.

Geocator retrieval, Resighting, and Banding: Twenty-one adults were resighted in 2012 that were marked in a prior year. The return rate for adults equipped with geolocators was higher than the return rate of adults with only bands (71% versus 40%). We recovered eight geolocators during 2012, increasing the total number of retrieved units to 45% (14 of 31). Descriptions of migratory timing and routes, and wintering areas are forthcoming.

Eight of 44 adults that we banded during 2010–2011 were resighted during winter 2011–2012 at Guerrero Negro Lagoon and the Golfo de Santa Clara, Mexico, and one and two birds were resighted during spring 2012 at Grays Harbor, WA and the Copper River Delta, AK respectively. We observed three birds on the Seward Peninsula that were banded at Guerrero Negro, Mexico. We individually banded (green flags with unique alpha-numeric codes) an additional 19 adults and 32 chicks, which increased the total number of banded birds over the 3-year study to 63 adults and 77 chicks.

Breeding Ecology: We found 10 Red Knot nests. Average cover characteristics within a 10-m radius centered on the nest were: 21% lichen (0–39%), 1% moss (0–10%), 7% forb (0–16%), 12% graminoid (0–40%), 13.7% dwarf shrub tundra (2–38%), 40% bare rock (15–70%), and 4% bare soil (0–13%). Nests were on flat to slightly sloped terrain (mean = 7.5°) at 204–410 m (mean = 322 m) above sea level.

Initiation of laying, based on lay and hatch dates as well as estimates from floating eggs and chick development, ranged from 26 May to 11 June (median = 3 June, $n = 10$). Observed hatch dates ranged from 24 June to 4 July (median = 3 July, $n = 5$). Apparent nest success (≥ 1 egg hatched) of the 10 nests was 50%. Infrared trail cameras placed at nests indicated that all failed nests were depredated by red foxes.

Seroprevalence: Prevalence of AIV antibodies in the western Atlantic subspecies of Red Knot (*Calidris canutus rufa*) is among the highest worldwide for any bird. We sampled 20 adults and 16 chicks on the Seward Peninsula to assess whether AIV antibody prevalence is high for the species in general or restricted only to *rufa*. Blood samples were analyzed using commercial blocking enzyme-linked immunosorbent assay, and cloacal and oropharyngeal swab samples were analyzed using real-time reverse transcriptase chain reaction techniques. Preliminary results implied that seroprevalence for adult *roselaari* exceeded the highest value for *rufa* sampled at sites across the Atlantic Coast of North America and South America. Samples are now being analyzed to determine the sub-types of AIV present in the *roselaari* adults sampled in our study.

We are grateful to F. Diaz, L. Eberhart-Phillips, A. Minoletti, Noah Warnock, and Nils Warnock for their assistance with fieldwork.

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Red Fox (*Vulpes vulpes*) caught with a Red Knot's egg in its mouth at a nest on the Seward Peninsula, June 2012. Photo J. Johnson/USFWS.

#16 GEOLOCATOR TRACKING OF GOLDEN-PLOVER MIGRATIONS

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For the past several years we have used geolocators (data loggers) to define previously unknown transoceanic routes of Pacific Golden-Plovers (*Pluvialis fulva*) migrating between insular Pacific wintering grounds and breeding grounds in Alaska. Oahu-Alaska linkage was along a direct north-south flyway to nesting grounds that extended from the Alaska Peninsula to the Y-K Delta. Elsewhere on the winter range, pathways were more complex. Plovers wintering on islands and atolls to the south of Hawaii flew westward in spring and converged in Japan where they lingered for up to a month. These findings suggest that invertebrates foraged in Japan (probably from rice field habitats) provide vital energy resources for plovers as they migrate northward from non-breeding grounds located beyond the Hawaiian Islands. After departing Japan, the birds traveled northeastward to Alaska nesting grounds that were mostly farther north (from the Y-K Delta northward to the Seward Peninsula and Selawik region) than those of Hawaii birds. A detailed treatment of the foregoing was recently published in the *Wader Study Group Bulletin* (Vol. 119 (1): 1-8). For non-members of the WSG, the paper can be downloaded at <www.apaseem.org>.

Our fieldwork in the Nome area this season involved recapture of Pacific Golden-Plovers that were logger-equipped at their nest sites in 2011. The recovered geocator data are presently being analyzed. In addition, we captured and attached geolocators to nesting American Golden-Plovers (*P. dominica*). The latter project is in collaboration with J.F. Lamarre (University of Quebec) and Rick Lanctot (USFWS) and is part of a wide-ranging study of this plover at various locations on its breeding range. Nome represents the westernmost nesting grounds; Lamarre's research site is far to the east at Bylot Island, Nunavut.

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#17 BREEDING PHENOLOGY AND DAILY NEST SURVIVAL RATE OF WESTERN SANDPIPER, SEMIPALMATED SANDPIPER AND RED-NECKED PHALAROPES

INVESTIGATORS: EUNBI KWON, BRETT K. SANDERCOCK, KANSAS STATE
UNIVERSITY, WILLOW ENGLISH, DAVID B. LANK, SIMON FRASER
UNIVERSITY.

In birds, especially for the long-distance migrants exploiting short surge of food resources on their breeding ground, timing of breeding is a key predictor of reproductive success. Identifying the main predictor of laying date is difficult because timing involves complex dynamics between reliable environmental cues, local food availability, seasonal variation in predator abundance, breeders' condition as well as the potential trade-off between breeders' survival and breeding timing. In an effort of testing the effects of breeding timing on the nesting success and continuing on long-term monitoring on the breeding performance of three Arctic-breeding shorebirds, Western Sandpiper, Semipalmated Sandpiper, and Red-necked Phalaropes, we revisited a breeding site near Cape Nome, 13 miles east of Nome on the Seward Peninsula of Alaska in 2012.

2012 field report: The duration of field work was a 2.5-month period from May 12 to July 25, 2012. We resighted 166 unique individuals, including 99 Western Sandpipers, 65 Semipalmated Sandpipers, 7 Red-necked Phalaropes and one Dunlin. Resightings not matched with previous banding history were excluded from summary. We located nest sites for 73% and 68% of the resighted Western and Semipalmated Sandpipers respectively, demonstrating that both species have strong site fidelity to their arctic breeding territories. During nest searching, we located a total of 232 nests of arctic-breeding shorebirds, including Western Sandpipers (n = 75 nests), Semipalmated Sandpipers (n = 61), and Red-necked Phalaropes (n = 96). Of the 136 sandpiper nests, 65% hatched young, 23% were depredated, 11% had unknown fate and <1% were abandoned. In 2012, 27 nests out of 82 successful nests (defined as the nests where at least one chick survived until hatching) experienced only partial hatching success, which gives total of 52 eggs out of 133 eggs from successful nests failed to hatch. We captured and banded a total of 1,145 shorebirds, including 408 Western Sandpipers (130 adults, 136 chicks on the nests and 142 juveniles at the end of the breeding season), 224 Semipalmated Sandpipers (74 adults, 118 chicks and 32 juveniles) and 513 Red-necked Phalaropes (116 adults, 396 chicks and 1 juvenile). We deployed a total of 14 geolocators on sandpipers in 2011 and successfully retrieved 4 of the 14 geolocators in 2012 (1 Western Sandpiper and 3 Semipalmated Sandpipers). Monitoring of environmental conditions included setting up a weather station for climatic conditions, surveys of seasonal snowmelt, measurement of water levels in tundra ponds, sampling of invertebrates in terrestrial and aquatic habitats, live trapping of lemmings and other small mammals, and daily counts of predators encountered during field activities (primarily jaegers, falcons, arctic and red fox). To monitor the density of small mammals on the study plot, we conducted live-trapping sessions for three days at the beginning of the season and six days at the end of the season, with total 220 Sherman traps in transects. Given trapping scheme gave us a total of 1,320 trap checks. Tundra voles were the majority of trapped individuals (101 out of 108 individuals trapped) with

occasional captures of red-backed voles (4) and collared lemmings (3). Recapture rates were high within each trapping session, thus 59 occasions out of 108 trappings were recaptures.

Breeding timing and daily nest survival rates: Of 642 sandpiper nests monitored during breeding survey in 1993 – 1996 and 2010 – 2012, the mean clutch initiation was around May 28 ($148.3 \pm .3$) and the mean hatching was around Jun 21 ($172.3 \pm .3$). Including total of 136 nests monitored in 2012 to the analyses did not change the negative correlation between the daily mean temperature and the timing of clutch initiation that has been shown with the breeding population in Nome (regression coefficients were -2.308 and -1.395 and for Western and Semipalmated Sandpipers respectively). We estimated the daily nest survival rate for sandpiper nests monitored during 2011 – 2012 ($n = 251$), and tested the effects of following variables in program MARK; year, species, female age, daily minimum temperature, % nest cover, nest age and linear. The best model included ‘year’, ‘female age’, and ‘nest age’ (AICc weight = 0.53). Daily nest survival rate thus decrease as the nest ages (since incubation), and was overall higher with after-second-year breeders than with second-year breeders for both species. In both female age groups, Semipalmated Sandpipers had higher daily nest survival and overall survival rate was higher in 2012. Summing AIC weights across models, the weight of support was the strongest for the ‘year’ (cumulative $\omega_i = 0.79$) followed by the ‘nest age’ (cumulative $\omega_i = 0.73$) and ‘female age’ (cumulative $\omega_i = 0.65$). We also identified marginal impacts of ‘% nest cover’ and ‘seasonal timing’ on the daily nest survival rates (positive upslope trend for both variables). In conclusion, the laying date was best predicted by the local temperature during breeding season whereas the daily nest survival was more dependent upon female age, nest age and annual variation which we need to verify with further analyses.

Field monitoring and biological sampling will continue through 2013 in pursuit of testing the impacts of climate change on reproductive performance and population demography of two sandpiper species. Fieldwork in 2012 was supported through the NSF Polar Program and the Alaska Fish and Game Non-Game program, with matching funds from Simon Fraser University and Kansas State University. We thank the Sitnasauk Native Corporation for their cooperation.

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#18 REPRODUCTIVE ECOLOGY OF SHOREBIRDS: STUDIES AT BARROW, ALASKA, IN 2012

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WILDLIFE SERVICE; JENNY CUNNINGHAM, UNIVERSITY OF MISSOURI-
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In 2012, we conducted the tenth year of a long-term shorebird study at Barrow, Alaska (71.29°N , 156.64°W). The objectives of this study are to collect baseline data on (1) temporal and spatial variability of shorebird diversity and abundance, (2) nest initiation and effort, replacement clutch laying, clutch and egg size, nest and chick survival, and other demographic traits of arctic-breeding shorebirds, (3) to establish a marked population of as many shorebird species as

possible that will allow us to estimate adult survival, mate and site fidelity, and natal philopatry, and (4) to relate weather, food availability, and predator and prey abundances to shorebird productivity. In addition to these objectives, Barrow conducted a third year of data collection as part of the Arctic Shorebird Demographics Network (ASDN) in 2012 (see the overall summary for objectives of the ASDN).

We located and monitored nests in six 36-ha plots in 2012. All six plots are the same as those sampled in 2005-2011 and were searched with the same intensity as in past years. A total of 396 nests were located on our plots and an additional 38 nests were found outside the plot boundaries. Our total number of nests located on plots was the 2nd highest in this 10-year study (very close to the high of 407 in 2011). Nests on plots included 144 Red Phalaropes, 91 Pectoral Sandpipers, 52 Semipalmated Sandpipers, 36 Dunlin, 24 Red-necked Phalaropes, 17 Long-billed Dowitchers, 14 Western Sandpipers, 13 American Golden-plovers, 4 Baird's Sandpipers, and 1 Ruddy Turnstone. No White-rumped or Buff-breasted Sandpiper nests were found on the plots in 2012. The breeding density of all shorebird species on our study area was 183.3 nests/km² in 2012; this was close to the all-time high density of 2011 (188.4 nests/km²), and was slightly over 1.5 times our long-term average of 110.5 nests/km². In 2012, eight species nested in higher densities than in an average year (American Golden-Plover, Baird's, Pectoral Sandpiper, Semipalmated, and Western Sandpipers, Red and Red-necked Phalaropes), two nested at densities below the 10-year average (Buff-breasted and White-rumped Sandpipers), two nested at densities similar to the 10-year average (Dunlin and Long-billed Dowitcher), and one species nested on our plots for the first time (Ruddy Turnstone).

The first shorebird clutch was initiated on 28 May – 5 days earlier than the long-term average of 2 June. Peak initiation date was 6 June and the median initiation date was 11 June; these dates were 5 and 2 days earlier, respectively, than the long-term average. Median nest initiation dates for the more abundant species were 6 June for Semipalmated Sandpiper, 8 June for Dunlin, 10 June for Red Phalarope, and 14 June for Pectoral Sandpiper. Median initiation dates were earlier for all species (compared to their respective 10-year averages), except for Red-necked Phalaropes, whose median initiation date was the same as their 10-year average.

Predators destroyed 7.8% of the known-fate nests ($N = 410$) in 2012. This is much less than the 10-year average of 30.5% and similar to other years with fox control (2005-2011, except for 2009 which had 68.8% predation). Across the more abundant species, apparent hatching success (# hatching at least one young/total number of known-fate nests) was highest in Red Phalarope (93.0%, $N = 143$), Red-necked Phalarope (92.0%, $N = 25$), Dunlin (90.2%, $N = 41$), Semipalmated Sandpiper (84.2%, $N = 57$), and Pectoral Sandpiper (89.0%, $N = 91$). We suspect the high nesting success in 2012 was similar to reasons stated for 2011 (especially when compared to 2009). First, lemming numbers had increased again in 2012 compared to the very low levels in 2009, possibly providing an alternative food source for fox and other predators. Second, vegetation has continued to grow back since lemmings decimated several of the plots in 2009, providing concealment to nests from avian predators. Third, fox trapping efforts continue to be very effective and successful in 2012 due to increased trapping spatial extent and intensity by the USDA Wildlife Services-employed trappers.

In 2012 we captured and color-marked 421 adults. This was the highest number of birds captured in any year, and was 1.5 times higher than the 10-year average of 280. Forty-two of these adults (11 Dunlin, 16 Semipalmated Sandpipers, 9 Red Phalarope, 3 Red-necked Phalarope, and 3 American Golden-plover) had been banded in a prior year. An additional two adults captured had been banded as a chick in a previous year (1 Dunlin from 2006 and 1 Semipalmated Sandpiper from 2010). Adults captured included 98 Red Phalaropes, 81 Semipalmated Sandpipers, 78 Pectoral Sandpipers, 63 Dunlin, 28 Long-billed Dowitchers, 23 Red-necked Phalaropes, 22 American Golden-plovers, 21 Western Sandpipers, 6 Baird's Sandpipers, and 1 Ruddy Turnstone. We captured and color marked 1012 chicks. This was over twice the 10-year average of 477 and much higher than our previous high of 848 in 2011. High nest success, coupled with the completion of Andy Doll's study in 2011 (see his summary), allowed time for many more adult and chicks to be captured and banded. We also re-sighted many previously banded adults instead of spending additional time physically capturing them. In total, 128 previously color-marked individuals were observed or captured in 2012. Most were Dunlin ($N = 57$) or Semipalmated Sandpipers ($N = 45$); far fewer previously marked Red Phalaropes, American Golden-plovers, Red-necked Phalaropes, Long-billed Dowitchers, and Western Sandpipers were re-encountered ($N = 13, 8, 3, 1,$ and $1,$ respectively).

In regard to other environmental features at Barrow, the summer of 2012 appeared to be an average snow melt year with 50% of the snow being absent from the tundra on 7 June (average date is 8 June). However, shorebirds initiated nests earlier than normal – the peak nest initiation date (6 June) was five days earlier than the long-term average peak date. Lemming numbers continued to increase in 2012, following the pattern of increase since the very low lemming abundance of 2009, but they were still far below levels experienced in 2006 and 2008. Despite these increasing lemming levels in 2011, there were still only a few Snowy Owls and Pomarine Jaegers nesting in the Barrow area.

We continue to conduct ancillary studies as time allows at Barrow. As part of the ASDN, we collected one more geolocator from a Dunlin to assess migratory connectivity (S. Yezerinac, Mount Allison University), as well as samples from a variety of shorebirds to assess the presence of avian malaria (see summary by Wisely et al.) and levels of methyl mercury (see summary by Perkins et al.). We also continue to collect feathers and blood samples for archiving and other isotope/genetic collaborations. Additional environmental data collected at the site include pond hydrology data for use in an invertebrate emergence modeling exercise (Dan Rinella, Univ. of Alaska Anchorage) and nest initiation data to relate to NDVI values (Kirsty Gurney, Univ. of Alaska Fairbanks, and David Ward, USGS). Jenny Cunningham (MS candidate, Univ Missouri-Columbia) completed her second field season investigating habitat selection by shorebirds (see her summary). Kirsten Grond (PhD candidate, Kansas State University) conducted a pilot field season investigating gut microbiota in shorebirds in relation to immunity.

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#19 LONG-TERM MONITORING OF TUNDRA-NESTING BIRDS IN THE PRUDHOE BAY OILFIELD, NORTH SLOPE, ALASKA

INVESTIGATORS: JOE LIEBEZEIT AND STEVE ZACK, WILDLIFE
CONSERVATION SOCIETY

Since 2003, the Wildlife Conservation Society, in cooperation with BP Exploration [Alaska], Inc., has monitored nest survivorship, nest predator abundances, predator identity, and other parameters that may influence nesting success in the Prudhoe Bay Oilfield. This on-going monitoring effort is allowing a better understanding of potential impacts from industry, climate change, and other factors on breeding birds.

In 2012, we discovered and monitored 103 nests of 12 species from 2 June to 21 July on (or near) 12 10-ha study plots using both rope drag and behavioral nest search techniques. Semipalmated Sandpiper, Red-necked Phalarope, and Lapland Longspur nests accounted for the majority (64%) of those found. Among all species, 52 nests successfully hatched/fledged, 38 failed, and 13 nests were of unknown or undetermined fate. Nest predation was the most important cause of nest failure (84%). Other sources of nest failure were abandonment for unknown reasons ($n = 4$), trampling by caribou ($n = 1$), and observer-caused failure ($n = 1$). Overall nest density was 77.5 nests / km², noticeably lower than last year (98.3 nests / km²) but within the overall range of other years monitored.

Overall, seven species of potential nest predators were detected during timed surveys with the most common being Glaucous Gulls and Parasitic Jaegers. Pomarine Jaeger and Snowy Owl detections were noticeably lower this year compared to 2011. Lemming activity at this site was also noticeably reduced from last year (0.069 vs. 0.0209 lemmings observed / 30 min. survey in 2011 and 2012 respectively). We identified 21 predation events using remote camera systems at active nests including three red fox, 11 arctic fox, six Parasitic Jaegers, and one Common Raven.

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#20 BREEDING BIRD DIVERSITY, DENSITY, NESTING SUCCESS AND NEST PREDATORS AT A STUDY SITE ON THE IKPIKPUK RIVER IN THE TESHEKPUK LAKE SPECIAL AREA, NORTH SLOPE, ALASKA

INVESTIGATORS: JOE LIEBEZEIT AND STEVE ZACK, WILDLIFE
CONSERVATION SOCIETY

The Wildlife Conservation Society is completing an assessment of the importance of the northeast National Petroleum Reserve-Alaska as a breeding ground for migratory birds since this region is challenged by increasing interest in oil development yet little is known about the

breeding parameters for most nesting bird species in this region. In 2010, we established a new site along the Ikpikpuk River. Our objective is to collect baseline information on diversity of tundra-nesting birds, breeding biology (most importantly nest density and survivorship), nesting habitat preference, nest predator abundance, nest predator identity, and other factors known to influence nest survivorship. We compare these results with other sites on the North Slope to help evaluate the importance of this region for breeding birds.

In 2012, we re-established six of 12 10-ha study plots on the east side of the Ikpikpuk River approximately 30km south of the river mouth (70.55242° N; 154.73222°). We detected 59 bird species at the site during daily species surveys and over 30 of these species we directly observed nesting or discovered other evidence indicating they likely nest at the site. On or near our study plots, we discovered and monitored 97 nests of 15 species from 5 June to 15 July using both rope drag and behavioral nest search techniques. Semipalmated Sandpiper ($n = 30$), Lapland Longspur ($n = 21$), and Greater White-fronted Geese ($n = 11$) nests accounted for the majority (64%) of those found. Among all species, 61 nests successfully hatched/fledged and 35 failed. We were unable to reliably assess the fate of one nest because of inconclusive evidence at the nest site or because the nest was still active when the field season ended. Nest predation was the most important cause of nest failure accounting for 29 of 35 (83%) of failed nests. Other sources of nest failure were abandonment ($n = 4$), and observer-caused failure ($n = 2$). Overall nest density was 135.0 nests / km² (similar to 2011: 125.8 nests / km²).

Lemming detections increased from 2011 to 2012 (0.086 to 0.123 detections / 30 min. survey). This detection rate was still considerably lower than that observed at a nearby site near Teshekpuk Lake in 2006 (0.334 lemmings / 30 min. survey). Seven species of potential nest predators were detected during timed surveys with the most common being Glaucous Gulls and Parasitic Jaegers. Pomarine Jaegers were detected in similar numbers as in 2011 while no Snowy Owls were detected on timed predator counts. We identified 26 nest predator events using remote camera systems at active nests including 22 arctic fox, one arctic ground squirrel, one red fox, and two Parasitic Jaeger events.

Arctic Shorebird Demographic Network – Ikpikpuk River site

Within the framework of our pre-existing breeding bird studies, we also established Ikpikpuk as an Arctic Shorebird Demography Network (ASDN) site in 2010. In 2012, we re-established two large plots (58 and 72 ha, respectively) where we focused on the ASDN adult survivorship component for four of the ASDN target species (Semipalmated Sandpiper, Dunlin, Red and Red-necked Phalarope). These involved finding nests, trapping the birds with bow nets and mist nets, color banding the captured birds, and collecting morphometric data. Data collected as part of our separate nest monitoring efforts, including predator activity, lemming abundance, and snow cover will be contributed toward the ASDN effort.

The following table contains a summary of target species discovered nests, birds captured and banded, and samples taken on the ASDN adult survivorship plots at Ikpikpuk in 2012:

Data measure	SESA	DUNL	REPH	RNPH	TOTAL
Number of nests found	50	17	20	20	107
Number of birds banded ¹	32	15	17	12	76
Number of resights	43	16	2	3	64
Genetic blood samples	44	21	19	15	99
Avian malaria samples	47	21	19	15	102
Mercury blood samples	47	21	19	15	102
Fecal samples	25	19	13	13	70
Feather samples	47	21	19	15	102

¹ Number of birds banded is the total of newly banded birds for 2012, excluding recaptured birds. However, blood, fecal, and feather samples were taken from all birds captured this year (n = 102).

We also continued terrestrial and aquatic insect sampling and monitoring climatic conditions using a HOBO weather station.

We collected blood for avian disease and mercury contaminants studies. Additional blood and feather samples were collected and are to be used in on-going and potential future genetic, hormone, and stable isotope studies (see table above).

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Geolocator-equipped Pacific Golden-Plover, near Nome, June 2012.
Photo by W. Johnson/MSU.

#21 ASSESSING CLIMATE CHANGE VULNERABILITY OF BREEDING BIRDS IN ARCTIC

INVESTIGATORS: JOE LIEBEZEIT, ERIKA ROWLAND, MOLLY CROSS, AND STEVE ZACK, WILDLIFE CONSERVATION SOCIETY

As climate change accelerates rapidly in the Arctic and influences wildlife populations, land managers will be increasingly challenged to cope with impending impacts. We used the NatureServe Climate Change Vulnerability Index (CCVI) to assess the relative vulnerability of 54 bird species that regularly breed in Arctic Alaska. The CCVI is a spreadsheet-based algorithm that integrates information on species sensitivity (intrinsic characteristics of an organism that make them vulnerable) and exposure (extrinsic factors of the rate and magnitude of environmental change) to generate relative vulnerability rankings. The CCVI results ranked two species as highly vulnerable (Gyr Falcon, Common Eider), seven as moderately vulnerable (Brant, Steller's Eider, Pomarine Jaeger, Yellow-billed Loon, Buff-breasted Sandpiper, Red Phalarope, Ruddy Turnstone), five as likely to increase (Savannah Sparrow, Lapland Longspur, White-crowned Sparrow, American Tree Sparrow, Common Redpoll) and the remaining species as stable with respect to projected climate changes until mid-century (based on multiple climate scenarios). Hydrological niche, species interaction, and disturbance regime were the most important sensitivity factors for the arctic breeding birds categorized as highly and moderately vulnerable. The assessment process should be viewed as a starting point toward understanding climate change vulnerability of these species to inform management and further research, as well as help guide planning priorities within Arctic Alaska. A detailed report will be available by the end of November 2012.

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#22 AN ARTIFICIAL NEST EXPERIMENT TO ASSESS DEVELOPMENT IMPACT ON NESTING BIRDS

INVESTIGATORS: JOE LIEBEZEIT, STEPHEN DINSMORE, AND STEVE ZACK, WILDLIFE CONSERVATION SOCIETY

Attraction of predators to centers of human activity on the Arctic Coastal Plain of Alaska may result in increased nest predation rates closer to infrastructure. In 2012, we initiated a project to refine our understanding of this issue by conducting a multi-year artificial nest experiment. In June/July of 2012 we set out surrogate shorebird and duck nests on 7 transects (4 shorebird, 3 duck) for a total of 280 nests. Surrogate nests consisted of 3 domestic duck eggs (simulating Northern Pintail nests) or 4 Japanese Quail eggs (simulating *Calidris* shorebird nests) placed in ground scrapes. Artificial nests (40 per transect) were placed approximately every 75 - 200 meters along each transect emanating from Group I and II infrastructure (infrastructure that provides high food potential and/or high structural value to potential subsidized predators;

Liebezeit et al. 2009). In the first trial of the experiment we documented much higher predation rates than expected and we suspect this may have been due, at least in part, to predators cueing into observer presence. For the second experimental trail we developed a new nest placement method that minimized human presence in the field and this seemed to correct the problem. We are currently performing preliminary nest survivorship analyses with the 2012 data. Results will be used to inform study design adjustments for the 2013 field season.

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#23 MIGRATORY BREEDING BIRDS USE OF RE-VEGETATED OIL PLATFORMS

INVESTIGATORS: INVESTIGATORS: JOE LIEBEZEIT AND STEVE ZACK,
WILDLIFE CONSERVATION SOCIETY

Over the past 15 years BP Exploration (Alaska), Inc. and others have begun efforts to rehabilitate abandoned exploratory oil drilling pads. Despite intensive rehabilitation involving gravel removal, reintroduction of native vegetation, and reshaping topography, no follow-up studies have been performed to assess the wildlife response to these efforts. In 2012, we initiated a project to determine bird nesting, feeding, and brood rearing use at rehabilitated oil pad sites. The findings from this study will enable us to develop specific recommendations that will provide land managers and industry with new information to assist in site rehabilitation providing the highest quality reclaimed habitat for nesting birds.

In June/July we conducted three point count (at 99 point count stations) and three line-transect bird count replicates, and two nest searches at 10 rehabilitated pads (and 10 paired plots on undisturbed tundra). We collected over 1000 detections of 33 bird species (including 10 shorebird species) during the count surveys. First year results suggest significant use of rehabilitated pads as foraging and loafing sites, particularly early in the season (early June). Overall nest densities of birds were much higher on paired undisturbed tundra sites than on rehabilitated pads. Only Semipalmated Plovers nested on rehabilitated pads although one other shorebird species (Semipalmated Sandpiper) were observed with broods at three different rehab sites. We also sampled microhabitat usage at 82 sites (and 82 paired random sites) for 10 species on 10 of the rehabilitated pads. We will continue to collect data for this project in 2013.

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#24 RANGE-WIDE CONSERVATION GENETICS OF BUFF-BREASTED SANDPIPERS

INVESTIGATORS: ZACHARY T. LOUNSBERRY, ANTHONY GRACE, BRETT K. SANDERCOCK, KHARA M. STRUM, SAMANTHA M. WISELY, KANSAS STATE UNIVERSITY; JULIANA B. ALMEIDA, UNIVERSITY OF NEVADA RENO; JOE LIEBEZEIT, STEVE ZACK, WILDLIFE CONSERVATION SOCIETY, AND RICHARD B. LANCTOT, U.S. FISH AND WILDLIFE SERVICE.

Range-wide monitoring of shorebirds (Aves: Charadriiformes) suggests that many species are declining. Unfortunately for many species, it is unknown whether distinct conservation units exist, making the management and preservation of these species difficult. One shorebird of conservation concern, the Buff-breasted Sandpiper (*Tryngites subruficollis*), is a New World migrant which breeds in the North American and Russian arctic and winters in southeastern South America. We conducted a molecular survey of samples representing each of three biogeographical regions (breeding, stopover, and winter) using nine polymorphic microsatellite loci and 1.5-kb of highly variable mitochondrial DNA (mtDNA) from the cytochrome *b* gene and mtDNA control region. We analyzed contemporary population structure, demographic trends, and phylogeographic patterns. Overall, microsatellite and mtDNA analyses revealed that Buff-breasted Sandpipers are panmictic at a global scale (e.g., mean F_{ST} between biogeographical regions = 0.005, $P > 0.05$) with effective population size (N_e) estimates ranging from 2,657 to 4,634 effective breeders and no signal of a recent genetic bottleneck. MtDNA analyses suggested a pattern of haplotype diversity consistent with a historic radiation from a single refugium (Tajima's D : -2.27, $P < 0.01$; Fu's F_S : -30.6, $P < 0.0001$), which we estimated to coincide with the Wisconsinan glaciation (10-110,000 YBP). Overall, our molecular analyses suggest that Buff-breasted Sandpipers should be treated as a single conservation unit, and management efforts for this species should focus on limiting future declines to ensure genetic viability is maintained.

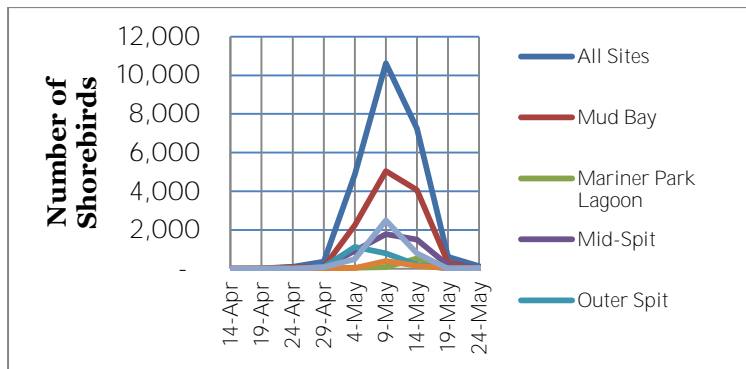
Contact: Zach Lounsberry, Junior Molecular Genetics Specialist, UC Davis Canid Diversity and Conservation Group, Veterinary Genetics Laboratory, PO Box 1102, Davis, CA 95617-1102, Phone: (856)430-1159, e-mail: zlounsb@ucdavis.edu

#25 KACHEMAK BAY SHOREBIRD MONITORING PROJECT: 2012 REPORT

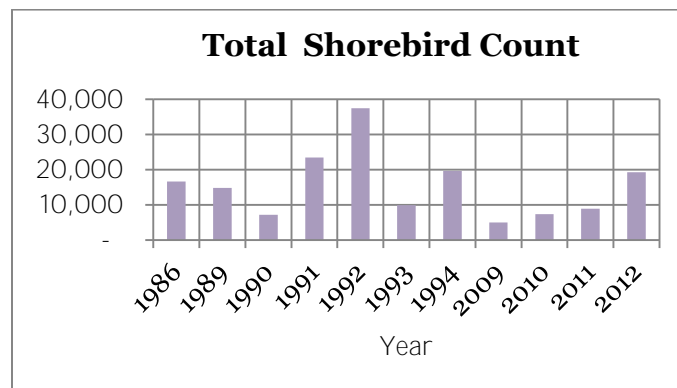
INVESTIGATORS: GEORGE MATZ AND THE KACHEMAK BAY BIRDERS

In 2009 the Kachemak Bay Birders (based in Homer, Alaska) started a Kachemak Bay Shorebird Monitoring Project in order to obtain a better understanding of the Homer Spit spring shorebird migration. Using a modified International Shorebird Survey protocol, for the past four years volunteers have simultaneously monitored six sites in the Homer Spit area for two hours every five days from mid-April to late-May. To provide observational consistency, monitoring begins when the outgoing tide is approaching 15.0 feet or at high tide if lower than 15.0 feet.

In 2012 a total of 28 volunteers participated in one or more of nine monitoring sessions that began April 14 and ended May 24. Monitors observed a total of 27 species of shorebirds and counted approximately 23,972 individual birds. The top 10 species includes Western Sandpiper (16,375), Surfbird (2,919), Red-necked Phalarope (1,501 all but one seen by boat), Dunlin (1,205), a lumping of unidentified *Calidris* (844), Black-bellied Plover (354), Dowitcher (153 almost all Short-billed), Semipalmated Plover (142), Least Sandpiper (103), and Pacific Golden Plover (95). The chart below summarizes when and where these shorebirds were counted.



One objective of this project is to compare data not only with other project years, but also Homer Spit shorebird monitoring by George West from 1986-1994. However, West monitored daily and our protocol is to monitor once every five days. Therefore, to provide a more direct match between data sets, the only West data we used for comparison is that which matches our monitoring dates. The comparison is illustrated in the chart below.



The chart shows that the total shorebird count for matched dates from 2009-2010 (average of 7,055) was considerably less than the average count for all West's years (18,346). However, our 2012 count was not only significantly higher (19,309) than our previous years, but higher than West's low count years. A review of our supplementary data revealed a significant reason; in 2012 the peak of three large pulses of migrating shorebirds occurred on the same day as our monitoring date. In our previous counts, the relatively short peak of the pulse never occurred on a scheduled monitoring date. Hence the count for those years missed a higher percentage of shorebirds that stopped at the Homer Spit during spring migration.

After our first year of monitoring we realized that thousands of shorebirds might be coming and going between our scheduled monitoring dates. In order to get a handle on how many birds we missed, in 2010 we began a supplementary monitoring effort where we spot check key sites on the Homer Spit every day during the peak of the migration. While this data does not follow protocol, it does allow us to identify pulses and roughly estimate how many shorebirds have been missed.

Our plans are to continue this monitoring project using the same protocol and supplementary monitoring. The results should shed more light on our 2012 results. Was this high count mostly due to an improbable coincidence between three large pulses and monitoring dates, or has there been an increase the past couple of years in the number of shorebirds stopping at the Homer Spit during spring migration? We also plan to begin monitoring at Anchor Point, a birding hotspot.

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#26 PREDICTING SHOREBIRD HABITAT ON THE ARCTIC COASTAL PLAIN OF ALASKA

INVESTIGATORS: SARAH SAALFELD, MANOMET CENTER FOR
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STEPHEN BROWN, MANOMET CENTER FOR CONSERVATION SCIENCES;
JAMES JOHNSON, USFWS; BRAD ANDRES, USFWS; JONATHAN BART, U.S.
GEOLOGICAL SURVEY

More so than any other region, the Arctic has experienced the effects of climate change in recent years, with warming rates almost twice the global average. Climate-mediated changes have the potential to dramatically shape shorebird habitats and ultimately population distributions. Along with climate-mediated effects on shorebirds, increased human development could have a direct negative impact on shorebird populations and breeding habitat within the Coastal Plain of Alaska in the near future. The first step to evaluating the potential impacts of climate-mediated changes and development on shorebird species within the Coastal Plain of Alaska is to document the current distribution of shorebirds and determine habitat selection patterns of shorebirds within this region. Unfortunately, the contemporary distribution as well as habitat associations of shorebirds on the Coastal Plain of Alaska is poorly known and only coarsely defined.

During 9 years between 1998 – 2008 (surveys were not conducted in 2003 and 2005; Figure 1), ground surveys were conducted on the Arctic Coastal Plain of Alaska as part of the Program for Regional and International Shorebird Monitoring (PRISM). During this time, 767 plots were surveyed using a single-visit rapid area search technique when shorebirds were establishing territories and incubating nests (8 June – 1 July). In 2012, we developed and mapped habitat suitability indices for 8 species of shorebirds (Black-bellied Plover, American Golden-Plover, Semipalmated Sandpiper, Pectoral Sandpiper, Dunlin, Long-billed Dowitcher, Red-necked Phalarope, and Red Phalarope) that commonly breed within the ACP of Alaska (see Figure 2 for example). Species specific habitat suitability indices were developed and mapped over an

85,000 km² region of the ACP of Alaska using presence-only modeling techniques (partitioned Mahalanobis distance) and landscape environmental variables.

For most species, habitat suitability was greater at lower elevations (i.e., near the coast and river deltas) and lower within upland habitats. Unlike the majority of species, however, elevation was not an important variable for American Golden-Plover and Long-billed Dowitcher, with predicted ranges for these species extending further south into the foothill region. Accuracy of models was high for all species, ranging from 65 – 98%. We predicted that the largest fraction of suitable habitat for the majority of species occurred within the National Petroleum Reserve-Alaska, with highly suitable habitat also occurring within coastal areas of the Arctic National Wildlife Refuge west to Prudhoe Bay.

For the first time, this study provides habitat suitability maps that illustrate predicted distributions for 8 species of shorebirds breeding within the ACP of Alaska. The habitat suitability maps developed in this study identify important regions for nesting shorebird species that may be used when establishing conservation priorities. Current distribution maps can now be used to understand and compare the potential impacts of specific development scenarios on nesting shorebirds. Additionally, habitat alterations due to climate change can now be assessed using climate change scenarios and current shorebird habitat associations.

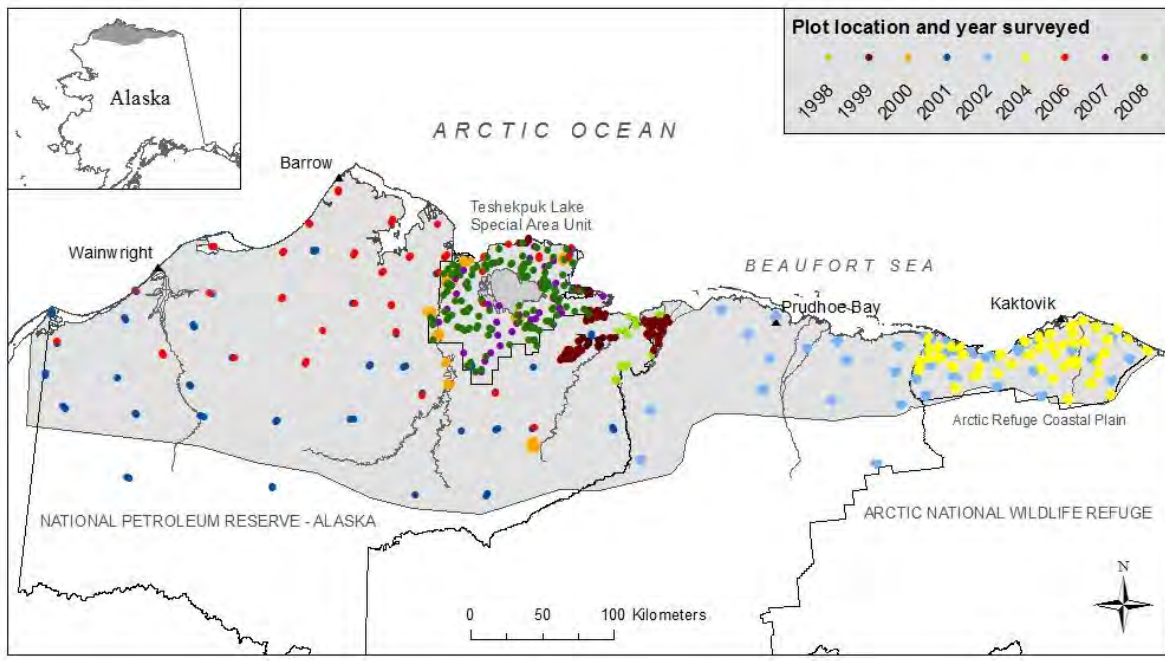


Figure 1. Location of the study area (shaded), major administrative boundaries, major rivers, and plots surveyed between 1998 and 2008.

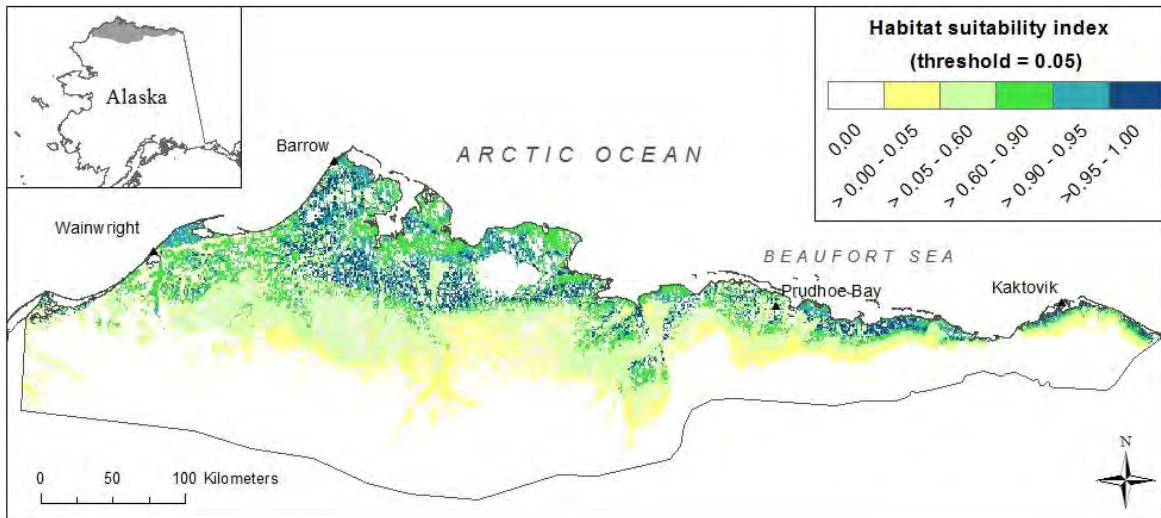


Figure 2. Habitat suitability map for Dunlin (*Calidris alpina*) breeding in the Arctic Coastal Plain of Alaska, 1998 – 2008. Colors below the 0.05 threshold value indicated the predicted absence of this species. Solid line indicates study area.

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#27 SHOREBIRD RESPONSE TO CONSTRUCTION AND OPERATION OF THE NORTH SLOPE BOROUGH LANDFILL IN BARROW, ALASKA

INVESTIGATORS: SARAH SAALFELD, MANOMET CENTER FOR CONSERVATION SCIENCES, U.S. FISH AND WILDLIFE SERVICE; RICHARD LANCTOT, U.S. FISH AND WILDLIFE SERVICE; STEPHEN BROWN, MANOMET CENTER FOR CONSERVATION SCIENCES; BROOKE HILL, U.S. FISH AND WILDLIFE SERVICE

Although much of the Arctic Coastal Plain (ACP) of Alaska has remained undeveloped, development from oil and gas industries and new and expanding villages is likely to increase in the near future. One potential impact of increased human development is increased anthropogenic waste, and the need to dispose of this waste in landfills. Construction of landfills directly removes suitable nesting habitat for arctic breeding species, as well as indirectly affects these species through 1) alteration of habitat, 2) disturbance to nesting and brood-rearing birds with landfill equipment, and 3) providing food subsidies that may artificially enhance predator populations (e.g., arctic fox [*Vulpes lagopus*], Glaucous Gulls [*Larus hyperboreus*], and Common Raven [*Corvus corax*]). As shorebirds dominate the avian fauna of the ACP of Alaska both in terms of abundance and diversity, they are the ideal species to investigate potential

impacts from development within this region, and may serve as a useful surrogate in assessing the potential impacts of landfills to less numerous species, such as the endangered Steller's Eider (*Polysticta stelleri*) that breed locally at Barrow. Accordingly, we investigated potential impacts of the North Slope Borough (NSB) landfill on breeding shorebirds by examining changes in environmental conditions (i.e., predator densities and timing of snow melt) and shorebird metrics (i.e., nest survival, nest density, nest initiation dates, and return rates) in relation to construction and operation (i.e., deposition of waste) of the landfill.

This study included one year of pre-construction data (2004), three years when landfill roads and fences were being constructed (2005 – 2007), and five years when waste was being deposited (2008 – 2012). During this time, 364 shorebird nests, representing 11 species, were monitored within a 36 ha plot (approximately half of which was inside the landfill and half outside). Construction of a fence around the landfill reduced snow levels inside the landfill, leading to earlier snow melt and likely to shorebirds initiating nests sooner. Avian predator densities did not increase as the landfill was constructed, but increased once waste was delivered. Despite these greater avian predator numbers, nest survival rates both inside and outside the landfill were generally high throughout our study. This high survival rate may have been partially due to a predator control program in the Barrow area, which reduced arctic fox (*Vulpes lagopus*) numbers around the landfill. However, we did detect greater nest survival rates inside the landfill compared to outside in all years when the landfill was present. We also noted greater nest densities for most species, as well as greater return rates for site faithful species, inside the landfill as compared to outside. Our results indicate that fences placed around landfills and procedures to reduce the attraction of predators to landfills can minimize indirect negative impacts of landfill construction and operation, and in some cases enhance shorebird breeding parameters.

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#28 THE EFFECTS OF GLOBAL CLIMATE CHANGE ON THE ANNUAL CYCLE OF HUDSONIAN GODWITS

INVESTIGATORS: NATHAN SENNER, CORNELL UNIVERSITY; ROBERT GILL, U.S. GEOLOGICAL SURVEY; NILS WARNOCK, AUDUBON ALASKA; ELДАР RAKHIMBERDIEV, ROYAL NETHERLANDS INSTITUTE FOR SEA RESEARCH; DAVID DOUGLAS, U.S. GEOLOGICAL SURVEY

We returned to my field site at Beluga, Alaska for a final field season in May 2012. The season was a tremendous success, as we recovered 23 of the geolocation tracking devices — a new record high recovery rate — that we had placed on adult Hudsonian Godwits at Beluga the preceding summer. These 23 devices brought our total number of tracking devices recovered to 60 over the past three years and gave us a total of 34 individual godwits tracked, 18 of which were tracked for two years, and 10 for three years.

Following up on the recovery of these migration tracks, we have been modeling how the occurrence of extreme weather events affects godwit migration and what the future increased incidence of these events will mean for ability of godwits to adapt to other changes wrought by climate change. Our analysis suggests that modest increases in the occurrence of storms moving south across the Great Plains of North America could cause godwits to make extra stops during their migration and delay their arrival at their breeding sites, making it more difficult for godwits to adapt to the earlier springs currently occurring across the sub-arctic of Alaska and Canada. We hope to soon complete and publish this initial analysis, and move on to a second analysis that will include working with global climate models to understand exactly how storm tracks in the Great Plains will change in the coming century.

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29 TEMPORAL AND SPATIAL USE PATTERNS OF THE BRISTOL BAY COAST BY SHOREBIRDS

INVESTIGATOR: SUSAN E. SAVAGE, U.S. FISH AND WILDLIFE SERVICE

In 2011 the Ecological Services branch of USFWS Region 7 prepared part of the Bristol Bay Watershed Assessment that was subsequently presented to the Environmental Protection Agency. This action was in response to a request from Bristol Bay Native organizations to assess the impact of heavy metal mining in the upper Kvichak and Nushagak drainages, especially to salmon resources and to species that were heavily dependent on Marine Derived Nutrients. One group that was identified was shorebirds. To better quantify shorebird use patterns along the Bristol Bay marine coast, a series of coastline aerial surveys is being conducted during the ice-free season of 2012 to document temporal and geographic information about shorebird use of the area. The survey includes the Bristol Bay coast from Coffee Point (north of Egegik) to Cape Constantine (tip of Nushagak Peninsula). Shorebirds are characterized by size (e.g., plovers as small, yellowlegs as medium, godwits as large) and numbers estimated during surveys; specific locations of birds are being mapped to examine geographic use patterns over time. At the time of this publication, we are still collecting field data. If geographic hot spots are identified during the aerial surveys, and funding allows, we plan to put up 2-3 time lapse cameras in 2013 to track intertidal use by birds with respect to time/tide and season.

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30 UPDATE ON ASSESSING THE POPULATION STATUS OF
BRISTLE-THIGHED CURLEWS (*NUMENIUS TAHITIENSIS*)
BREEDING IN THE SOUTHERN NULATO HILLS, ALASKA

INVESTIGATORS: KRISTINE M. SOWL, U.S. FISH AND WILDLIFE SERVICE
AND JAKE F. JUNG, TENNESSEE TECH UNIVERSITY

The Bristle-thighed Curlew (*Numenius tahitiensis*) is a rare species which breeds in two small areas of Western Alaska and winters exclusively on islands and atolls in the central and southern Pacific Ocean. Approximately 60% of the global breeding population breeds in the southern Nulato Hills on the Yukon Delta National Wildlife Refuge, while the remainder nests on the Seward Peninsula. The current status of the Bristle-thighed Curlew population is unknown. In 2010, we initiated a study whose objective is to assess the population status of the Nulato Hills breeding population. During the 2012 season, we continued intensive field work at our Allen Creek study site. We mapped 19 breeding territories, found eight nests, resighted at least 22 marked curlews, recorded 136 curlew activity budgets, and counted the number of curlews and other shorebirds detected at points that overlapped the study area. We also collected terrestrial invertebrates and sampled plant communities on curlew territories. Preliminary results indicate that curlew breeding density was lower in 2012; there were only 1.19 territorial males/km² in 2012 compared to 2.06 males/km² in 2011. A late spring snow storm occurred during the peak arrival period and may have influenced the number of curlews that settled at Allen Creek for the season. Nesting success was poor in 2012 and few broods were observed. We had a reduced capture effort during this final year of the study. We marked only 9 adults with coded green leg flags, bringing our total of marked adults to 77. The final component was added to our study in 2012. We conducted a region-wide population count in late May throughout the southern Nulato Hills. A total of 250 points on 14 transects were surveyed. In addition, four replicate surveys were conducted of points that overlapped the Allen Creek study area. Data will be analyzed this winter to generate a population estimate.

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The Bristle-thighed Curlew chick, an emerging berry and bug predator, may be cute now but wait till she gets big enough to munch the ubiquitous mosquitos, June 2012. Photo by K. Sowl/USFWS.

#31 AVIAN MALARIA SURVEILLANCE IN ARCTIC BREEDING SHOREBIRDS

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Avian malaria is a well-studied disease system in birds due to advances in molecular screening techniques of segments of the parasite genome. The disease agent is comprised of a paraphyletic group of haematozoa in three families (Plasmodidae, Haemoproteidae, and Alaska Shorebird Group 65 Leucocytozoidae) with an intermediate dipteran vector (Bensch et al. 2000). Avian malaria has been implicated in the extinction of avian species, and threatens the entire avian community of the Hawaiian Island ecosystem (van Riper et al. 1986). Some species may succumb directly to the disease (Jarvi et al. 2001), while in other species reproductive output is reduced (Ortego et al. 2008) making the population more vulnerable to extinction. Migrating species are exposed to multiple habitats often on different continents which can affect a host's parasite burden and has implications for the global spread of infectious diseases. Migratory birds have been implicated in the transmission and spread of infectious diseases such as avian influenza virus, West Nile virus and blood parasites (Rappole et al. 2000) and can potentially transmit these pathogens to naïve host populations. Thus, understanding host specificity of Plasmodium and its allies, and interspecies transmission can help elucidate routes and rates of vector-borne disease transmission in globally migrating avian species.

Samples were screened for haemosporidians (*Plasmodium*, *Haemoproteus* and *Leucozytozoon*) using primer pairs developed for the amplification of a 153 nucleotide segment of the RNA-coding mitochondrial DNA (343F 5'-GCT CAC GCA TCG CTT CT-3' and 496 5'-GAC CGG TCA TTT TCT TTG-3', Fallon et al. 2003). Polymerase Chain Reaction was conducted in an Eppendorf Eppgradient Thermocycler (Brinkman Inc. Westbury, NY, USA) in 20 µL PCR cocktails containing 1.5µL of extracted template DNA, 1X QIAGEN buffer, 2-2.5 µM MgCl₂, 0-0.8mg/ml of bovine serum albumin (BSA) 0.2-0.8µM dNTP's, 0.4-0.6µmol/L of each primer and 0.25-0.5 units of Taq polymerase (Go Taq Flexi, Promega, Madison, WI, USA). Thermocycling conditions followed the protocol described by Fallon et al. (2003). Each PCR reaction was run with both positive and negative controls. Parasite genome segments were visualized using gel electrophoresis.

We extracted DNA from 419 red blood samples sent to Kansas State University on 6 September 2011 by the Arctic Shorebird Demographics Network. Samples were collected from shorebirds during the breeding season of 2011. We determined quality and quantity of DNA from the extracted samples. DNA quality is measured as the ratio of absorption of light at wavelengths of 260nm and 280 nm. Our samples had an average ratio of 1.91±0.14 (Mean±SD). A ratio of 1.8 suggests pure DNA uncontaminated by organic molecules, and our samples are well within acceptable, useable values. The concentration of DNA in our samples averaged 149.49±146.46 ng/ul; we thus extracted ample DNA of high quality from all samples handled thus far. Of the 419 extracted blood samples we screened n=419 for avian malaria using polymerase chain reaction to amplify DNA of haemosporidians. We found a prevalence of 4.19% (n=10, Table 1.).

Table 1. Species and locations that screened positive for avian malaria.

Species	Common Name	Positives
<i>Calidris mauri</i>	Western Sandpiper	2
<i>Calidris melanotos</i>	Pectoral Sandpiper	2
<i>Calidris pusilla</i>	Semipalmated Sandpiper	2
<i>Limnodromus scolopaceus</i>	Long-billed Dowitcher	2
<i>Calidris alpina</i>	Dunlin	1
<i>Phalaropus lobatus</i>	Red-necked Phalarope	1
Total		10

Location	Positives
Barrow, Alaska	5
Cape Krusenstern, Alaska	3
Colville River Delta, Alaska	2
Total	10

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Western Sandpipers are common breeding shorebirds at Cape Krusenstern National Monument, June 2012. Photo by E. D’Astous/USFWS